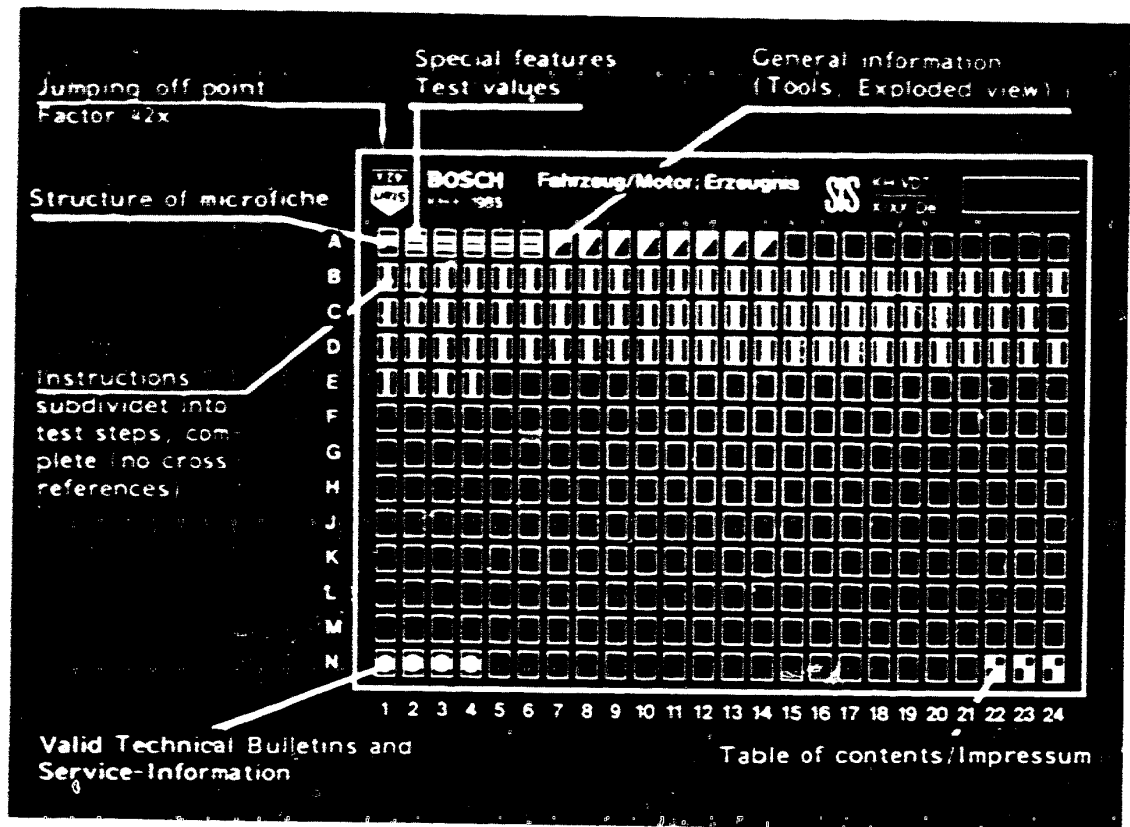


## Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

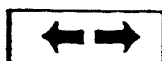
<b>E16</b>	Product/component/test step
	Vehicle/engine

Coordinate

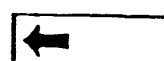
3. Limits of section



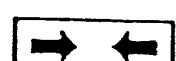
Beginning



Mid-section



End



One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6



<b>A1</b>	Trouble-shooting program	
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## 1. SPECIAL FEATURES

Repair instructions for in-line injection pumps of series PE(S).. P.. S 7100 and .. S 7800, without governor, manifold-pressure compensator, timing device and supply pump.

Dismantling and assembly of the various governor types are performed in accordance with the respective repair instructions.

## 2. TEST SPECIFICATIONS

### 2.1 Leak test on suction gallery

Test duration and test pressure:

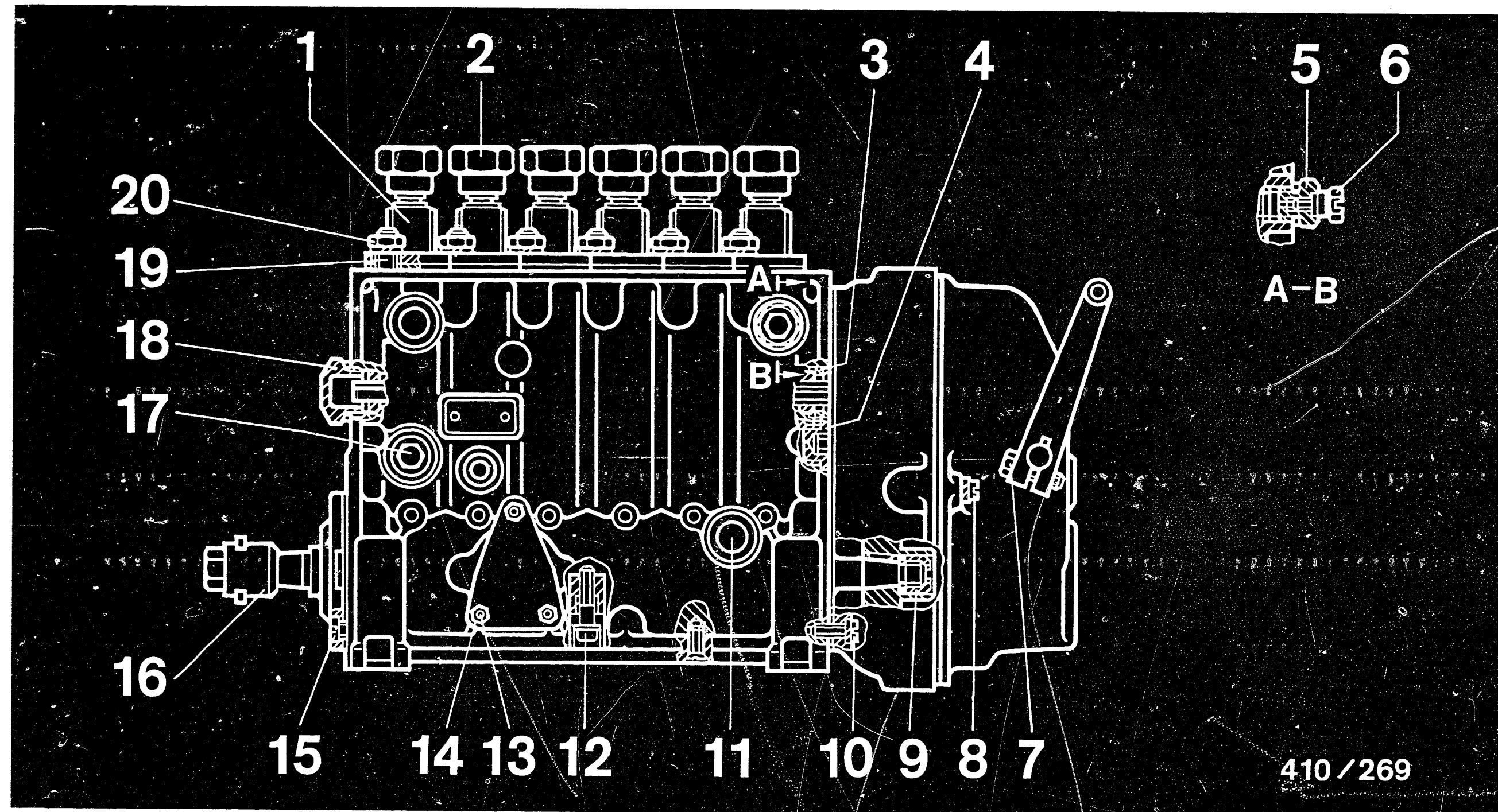
8 minutes at 5 bar, then 1 minute pulsating  
0 ... 5 bar.

### 2.2 Leak test on camshaft chamber, spring chamber, governor chamber

Test duration and test pressure:

7 minutes at 1.5 bar, then  
1 minute at 0.5 bar.





1 = Delivery-valve holder  
PE(S).. P.. A.. M 26 x 1.5 110...120 Nm  
2 = Union nut max. 25 Nm  
3 = Control-rod guide bushing 30 ...40 Nm

4 = Screw plug 40 ... 50 Nm  
5 = Threaded bushing 20 ... 30 Nm  
6 = Bleeder screw 4 ... 5 Nm  
7 = Control-lever fastening screw 11 ... 13 Nm

8 = Governor cover fastening screw 8 ... 10 Nm  
9 = Mechanical governor M 12 65 ... 75 Nm  
10 = Governor housing fastening screw 8 ... 10 Nm  
11 = Fitting M 16x1.5 30 ... 40 Nm

### 2.3 TIGHTENING TORQUES

**A3**

Test specifications

PE(S).. P.. S 7100, S 7800



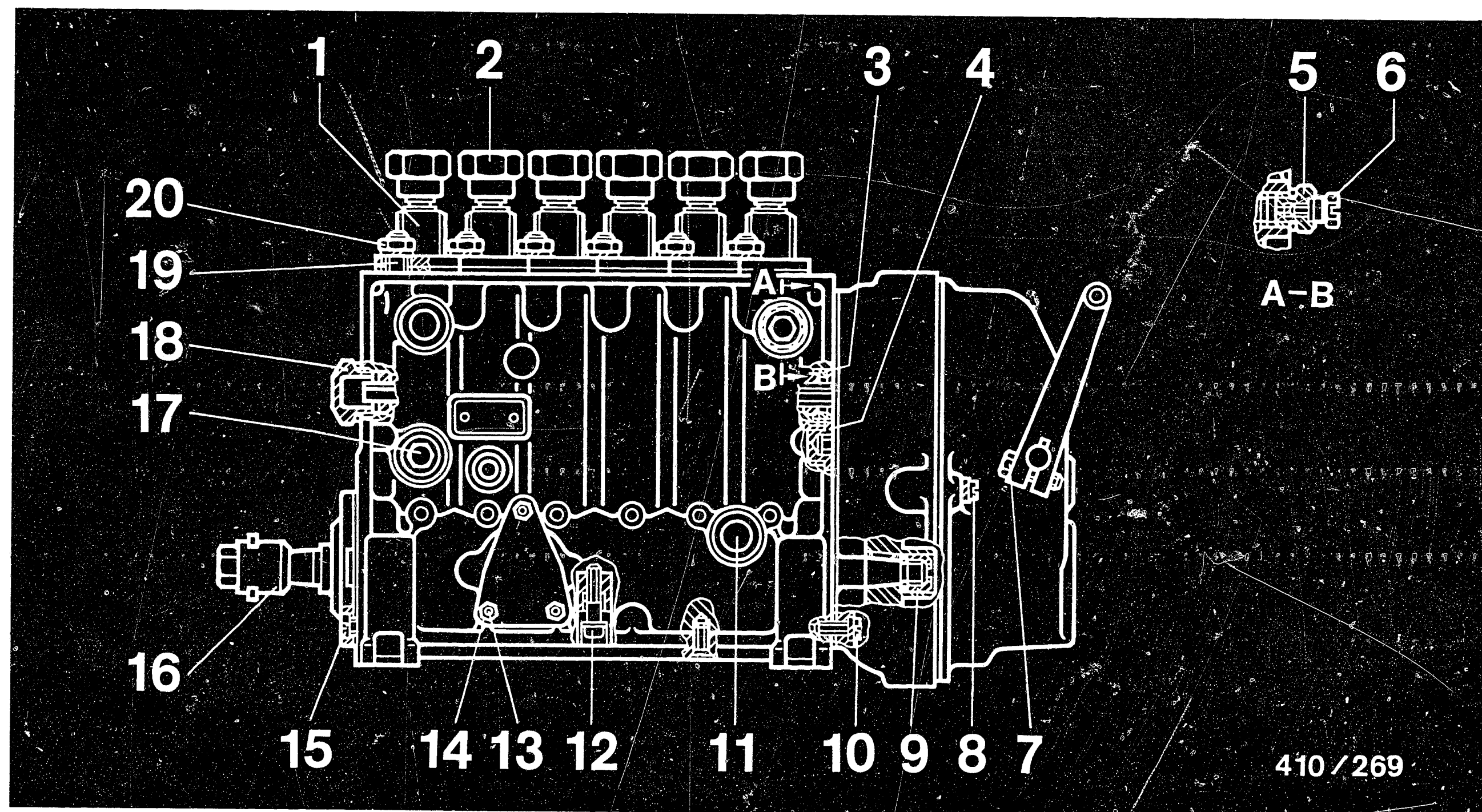
**A4**

Test specifications

PE(S).. P.. S 7100, S 7800



410 / 269



- 12 = Hexagon-socket-head cap screw/  
fillister-head screw for  
intermediate bearing  
13 = Threaded pin  
14 = Hexagon nut

8 ... 10 Nm  
3.5 ... 4.5 Nm  
7 ... 9 Nm

- 15 = Bearing cover  
fastening screws

- 15 = Couplings and  
timing device

cone diameter 30 mm 150 ... 170 Nm  
cone diameter 35 mm 170 ... 200 Nm

18 ... 20 Nm

- 17 = Screw plug  
18 = Closure cap  
19 = Headless  
setscrew  
20 = Hexagon nut

40...60 Nm  
40...60 Nm  
25...30 Nm  
40...45 Nm

Tightening torques (continued)

**A5**

Test specifications

PE(S).. P.. S 7100, S 7800



**A6**

Test specifications

PE(S).. P.. S 7100, S 7800





## General information

### Cleaning the parts

Wash the parts in low-inflammability, commercially available cleaning agent, e.g. Chlorothene NU.  
Then blow off with compressed air.

### Observe the following safety regulations.

Decree on Working With Combustible Liquids (Vbf) Issued by the Federal Ministry of Labor (BmA).

Safety rules for handling chlorinated hydrocarbons  
for the workshop           ZH 1/222  
for the employee           ZH 1/119  
issued by the Central Association of German Employers'  
Liability Insurance Associations (Central Association  
for Accident Prevention and Industrial Medicine)  
Langwartweg 103, D-5300 Bonn 5.

In countries outside the Federal Republic of Germany,  
observe the corresponding local regulations.

### Notes:

These repair instructions contain the complete repairing of in-line pumps of size "P", series "S 7100 and S 7800".

The various versions of in-line pump should be taken from the respective service-parts lists.



Worn and damaged parts must be discarded.

Sealing elements must always be replaced.

Injection-pump components that are stored for a lengthy period of time must be covered and protected against rust.

Radial-lip-type oil seal must be lightly oiled.

Elements and delivery valves must be washed out in cleaning agent; plungers must be wetted with calibrating oil.

Seal rings must be rubbed with tallow.

**A8**

General information

PE(S).. P .. S 7100, S 7800



#### 4. TOOLS AND FIXTURES

Description	Part Number	Use
Clamping support with clamping parts for cradle mounting	KDEP 2919 KDEP 2919/2	Mounting the injection pump
Clamping device	KDEP 2985	Clamping device for base mounting
1 set of intermediate pieces	KDEP 2985/4	for pump S 7800 with cradle mounting
Support clamp	KDEP 2963	Pumps with flange mounting
Over-long shaft	KDEP 2919/1/13	Used for 10- and 12-cyl. injection pumps
Assembly tool for timing device	KDEP 2944	Removing and mounting of timing device EP / SP(Z) with cone $\varnothing$ 20 mm
Pin-type socket wrench	KDEP 2944/1	
Socket wrench	KDEP 2944/0	
Puller mandrel	KDEP 2944/2	
Holding wrench Slot width 12 mm	KDEP 2885	Holding and turning the camshaft
Holding wrench Slot width 16 mm	KDEP 1555	



Description	Part Number	Use
Tappet holder	KDEP 1553	Raising tappets
Puller	KDEP 2911 KDEP 2911/3	Pulling off barrel-and-valve assys
Mounting device	KDEP 1505 KDEP 1556	Pressing down roller tappets
Pin-type socket wrench	KDEP 1577	Screwing out and in threaded bushings on control rod
Mounting device	KDEP 2962	Holding barrel-and-valve assy
Socket wrench	KDEP 2986	Loosening delivery-valve holders
Insertion device	KDEP 2884	Insertion device for O-ring
Plunger pliers	KDEP 1575	Removing and introducing pump plungers
Box wrench	KDEP 2997	Turning barrel-and-valve assys
Forcing-off plate	KDEP 1580	Forcing off self-aligning roller bearing
Press-in tool	KDEP 1551	Pressing cylindrical-roller bearing into bearing cover
Press-in tool	KDEP 1552	Pressing in self-aligning roller bearing
Insertion device	KDEP 1071	Inserting control sleeve
Puller	KDEP 1557	Turning camshaft and pulling off drive flange

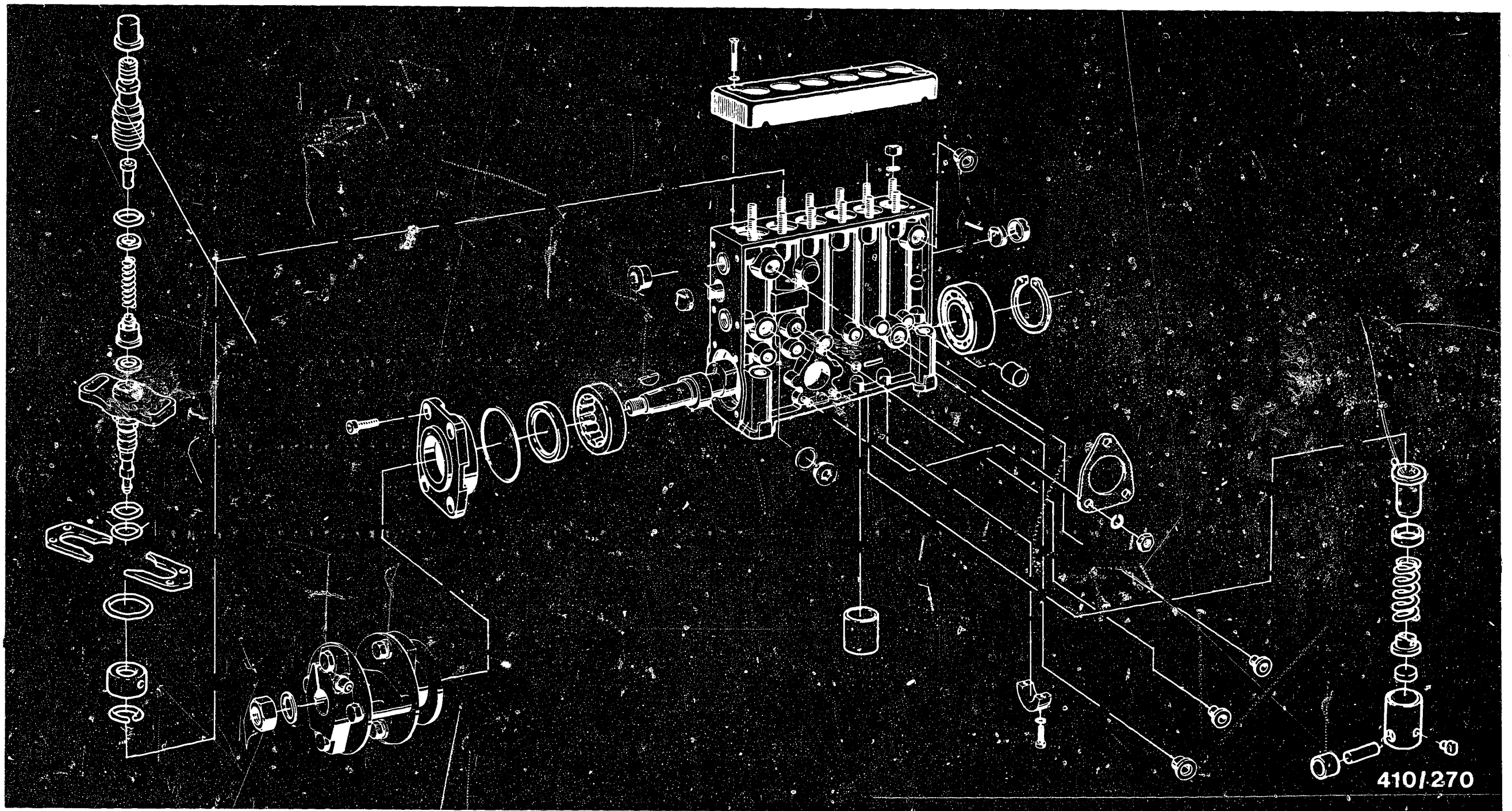


Description	Part number	Use
Shim rings	KDEP 1550	Placing under element flanges
Puller Support sleeve	KDEP 1056 KDEP 1056/0/7	Pulling end covers out of tappet-raising bore
Driving couplings cone dia. 30 mm, normal cone dia. 30 mm, short cone dia. 35 mm, normal cone dia. 35 mm, short	  1 686  1 686 430 019  1 686 430 017	
Puller	KDEP 1569	Pulling out self-aligning roller bearing
Press-in mandrel	KDEP 1554	Knocking in and out base end covers
Puller mandrel	KDEP 2938	Removing tappet springs
Press-out mandrel	KDEP 1572	Pressing out cylindrical-roller bearing dia.30 mm
Puller	KDEP 1570	Pulling bearing race dia. 35 mm out of bearing cover
Holding pin	KDEP 1571	Raising plungers for leak test
Directional-control valve	KDJE-P 100/1	Pressure reduction for leak test
Tappet forceps	KDEP 2941	Removing and installing roller tappets



Description	Part Number	Use
Mounting sleeve	KDEP 1548	Protection of drive-end cylindrical-roller bearing when installing camshaft
Mounting sleeve	KDEP 1549	
Press-in mandrel	KDEP 1058	Pressing end cover into tappet-raising bore
Press-on tool	KDEP 1558	Mounting radial-lip-type oil seal in bearing cover
Press-on tool	KDEP 1559	
Support ring	KDEP 1568	





5. EXPLODED VIEW

**A13**

Exploded view  
PE(S).. P..S 7100, S 7800

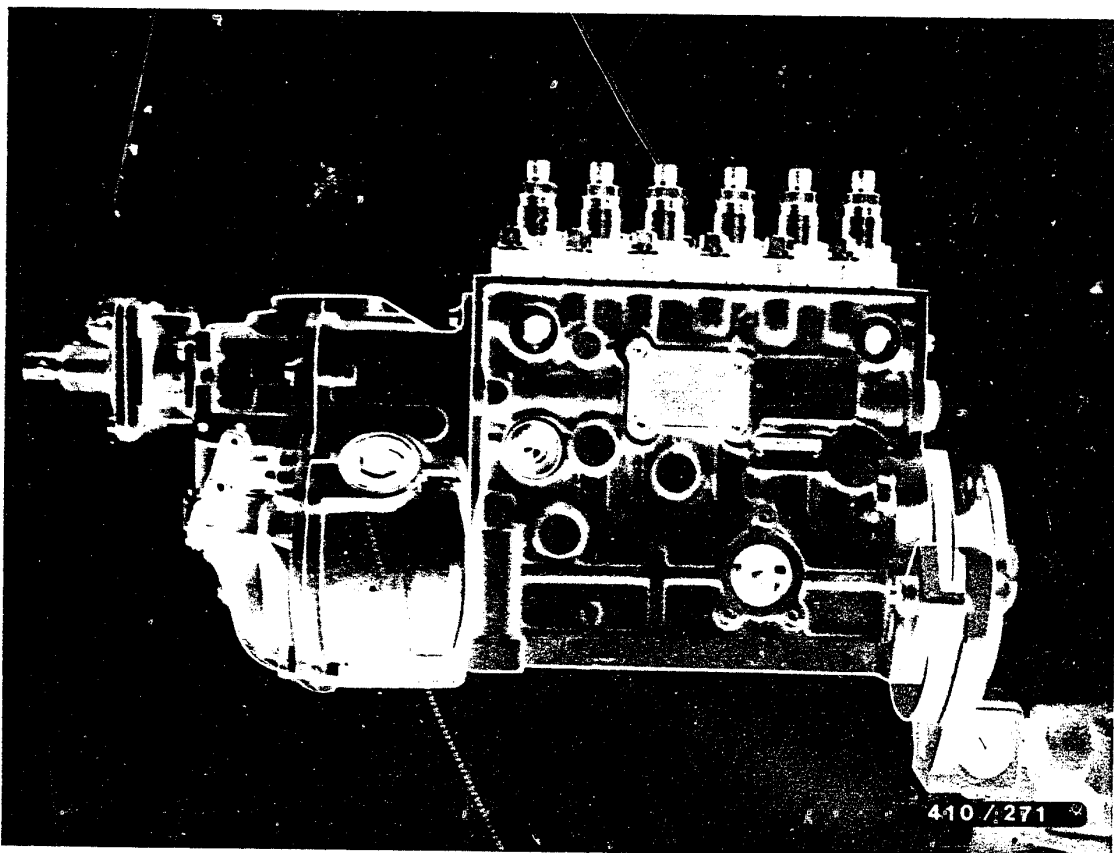


**A14**

Exploded view  
PE(S).. P..S 7100, S 7800







#### 6. DISMANTLE FUEL-INJECTION PUMP (WITHOUT MECHANICAL GOVERNOR)

Clamp in-line injection pump PE..P.. with base mounting on rotatable clamping support KDEP 2919 in conjunction with clamping device KDEP 2985.

Clamping parts KDEP 2919/2 are necessary for cradle-mounted injection pumps. Device KDEP 2985 with intermediate pieces KDEP 2985/4 is intended for pumps of series .. S 7800.

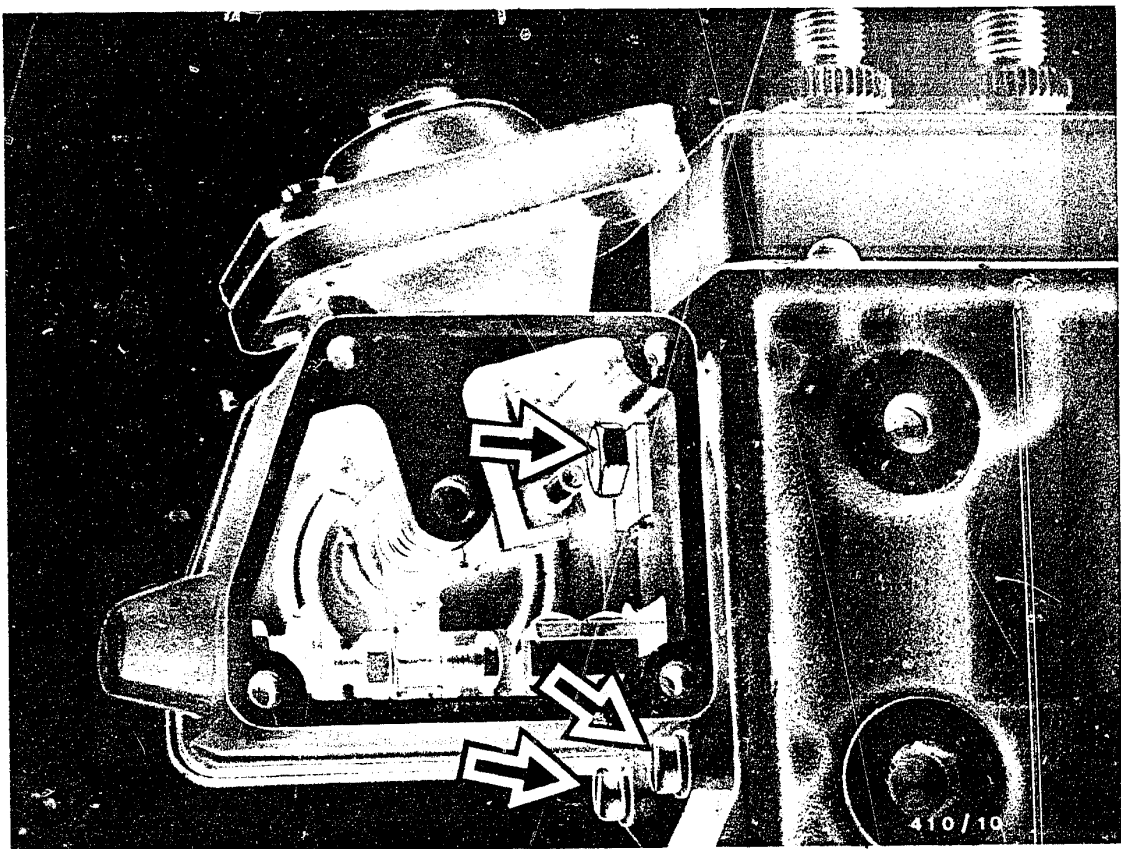
In the case of 10- and 12-cylinder injection pumps, it is necessary to use over-long shaft KDEP 2919/1/13.

Support clamp KDEP 2963 with matching fastening flanges is required for flange-mounted pumps (picture).

**B1**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





### Removing the manifold-pressure compensator

Unscrew closing cover from manifold-pressure compensator (already removed in the picture).

Remove fastening screws (see picture, arrows).

Take off manifold-pressure compensator.

#### Note:

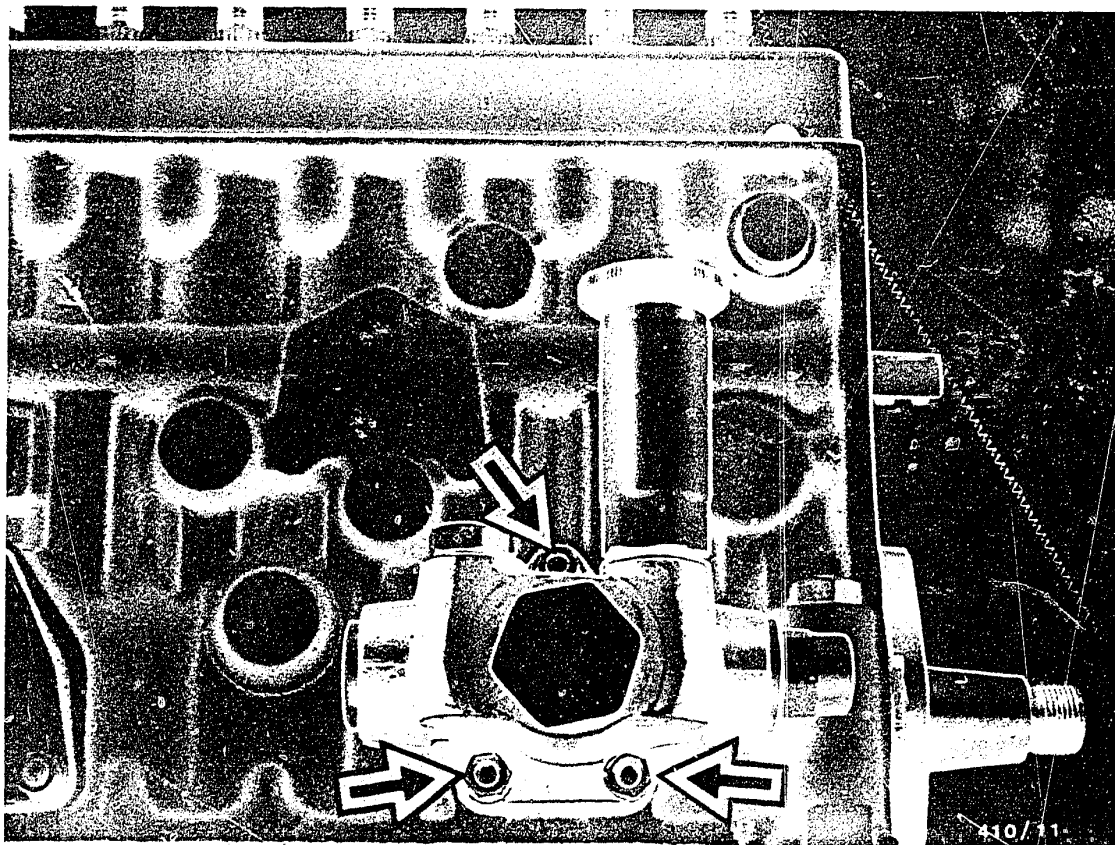
Remove and dismantle the governor in accordance with the respective repair instructions.

**B2**

Dismantle fuel-injection pump

PE(S).. P.. S 7100, S 7800





Remove supply pump

Loosen hexagon nuts (arrows) and unscrew.

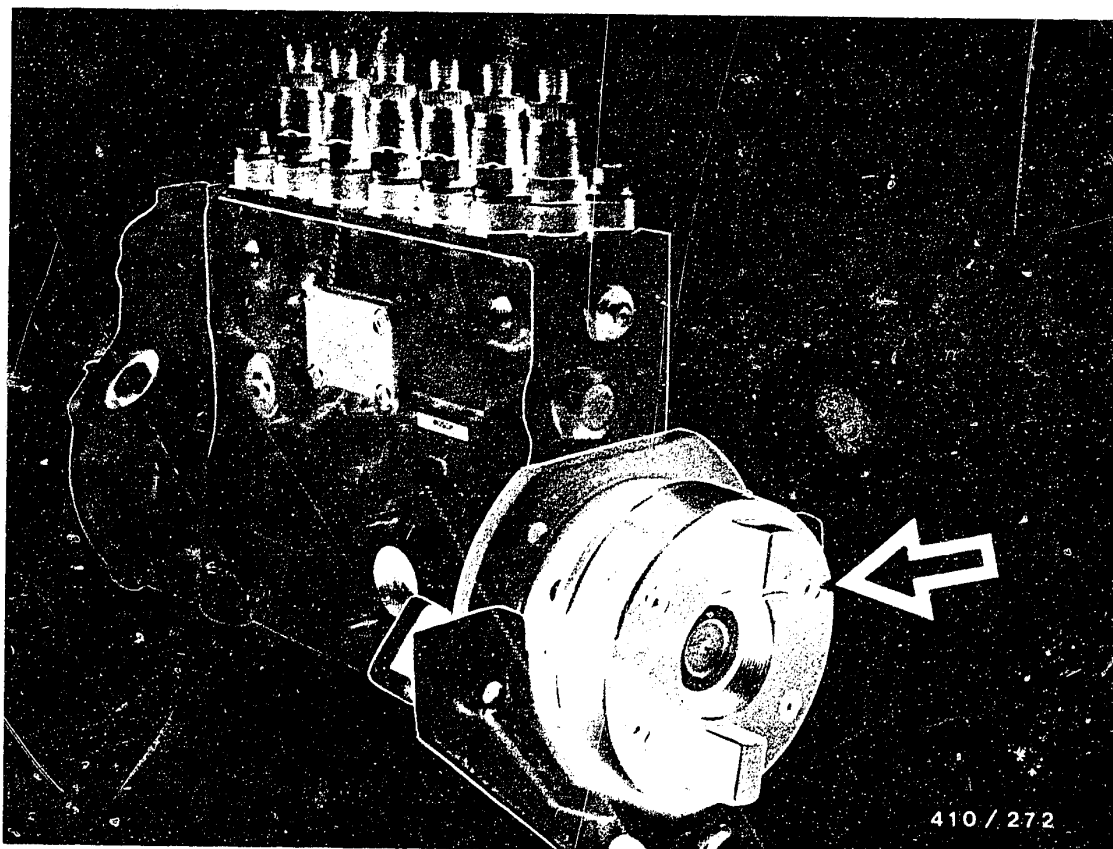
Remove supply pump with gasket.

**B3**

Dismantle fuel-injection pump

PE(S).. P.. S 7100, S 7800





410 / 272

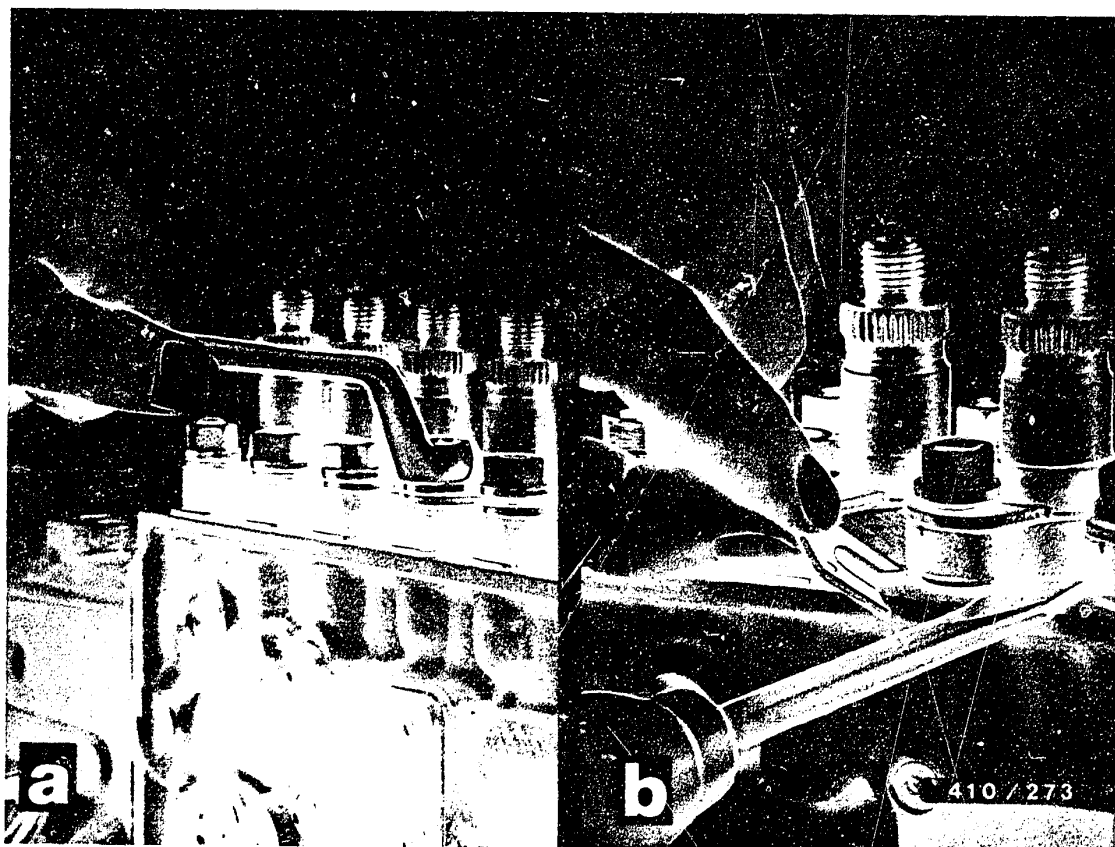
Mount driving coupling on camshaft.

If necessary, mount flange of puller KDEP 1557 on drive flange of injection pump (arrow).

**B4**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Loosen fastening nuts of barrel-and-valve assemblies and turn further by approx. 3 turns.

Raise barrel-and-valve assemblies with a screwdriver and remove prestroke-adjusting shims.

Note:

The prestroke-adjusting shims are matched in pairs as regards their thickness.

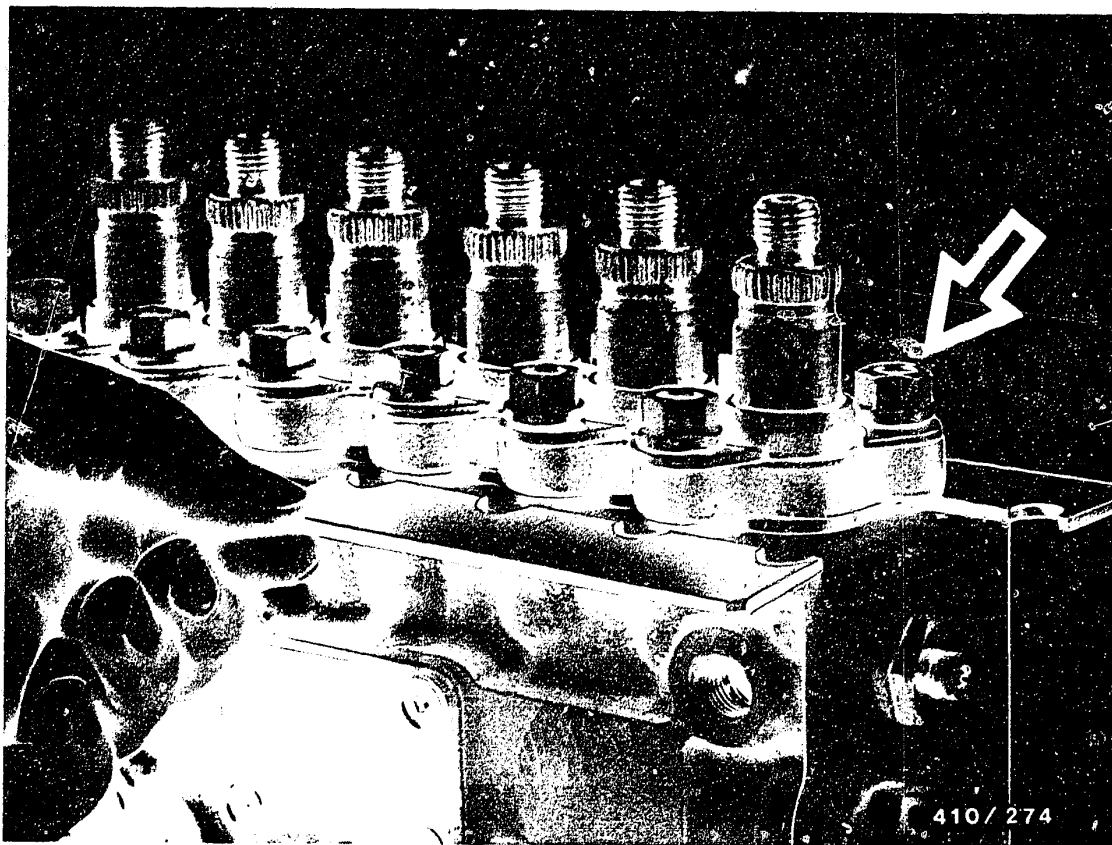
It is therefore advisable to keep them together.

**B5**

Dismantle fuel-injection pump

PE(S).. P.. S 7100, S 7800





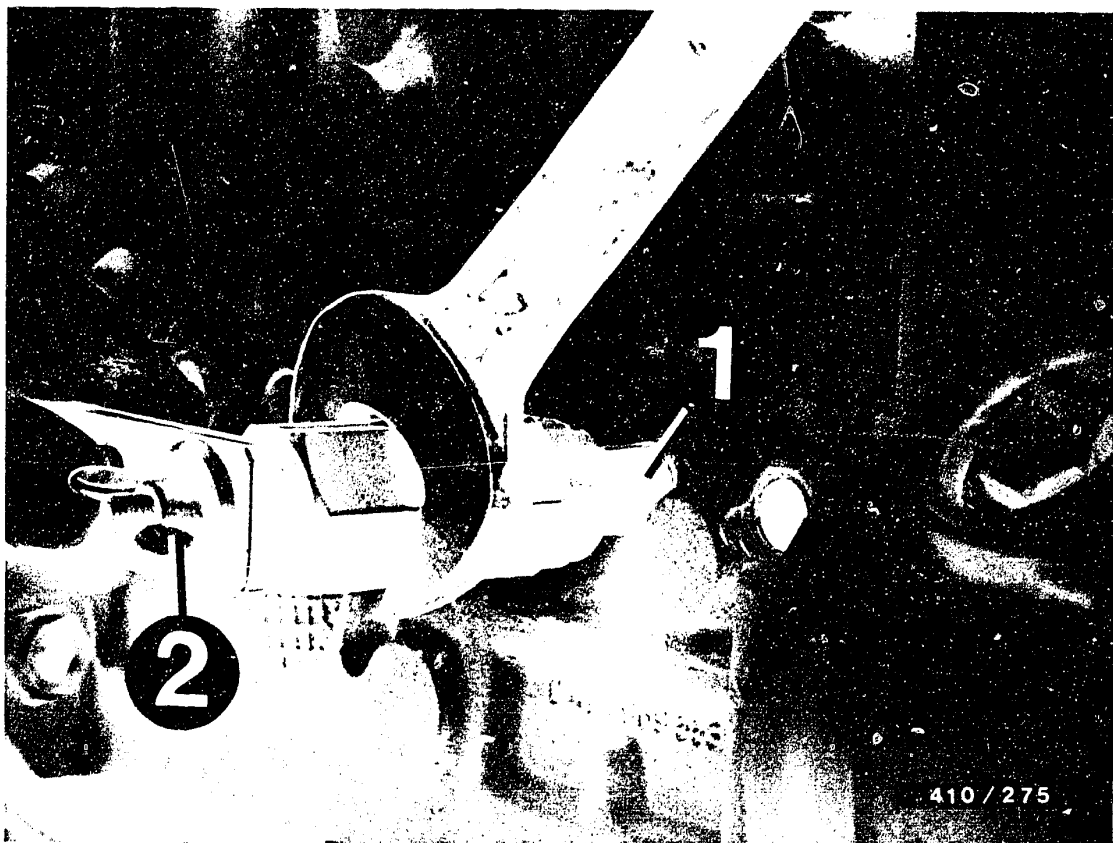
Insert spacer plates KDEP 1550 under the flanges of the barrel-and-valve assemblies instead of the prestroke-adjusting shims.

Provisionally re-tighten fastening nuts (arrow) by hand.

**B6**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





1 = Supporting sleeve KDEP 1056/0/7 2 = Wing nut

Place supporting sleeve on device KDEP 1056.

Turn back wing nut of device and introduce puller KDEP 1056 into end cover.

Screw in wing nut as far as possible in order to spread the collet of the device in the end cover.

Hold handle of device and, using the wrench, turn the sleeve of the puller until the end cover has been pulled out of the pump housing.

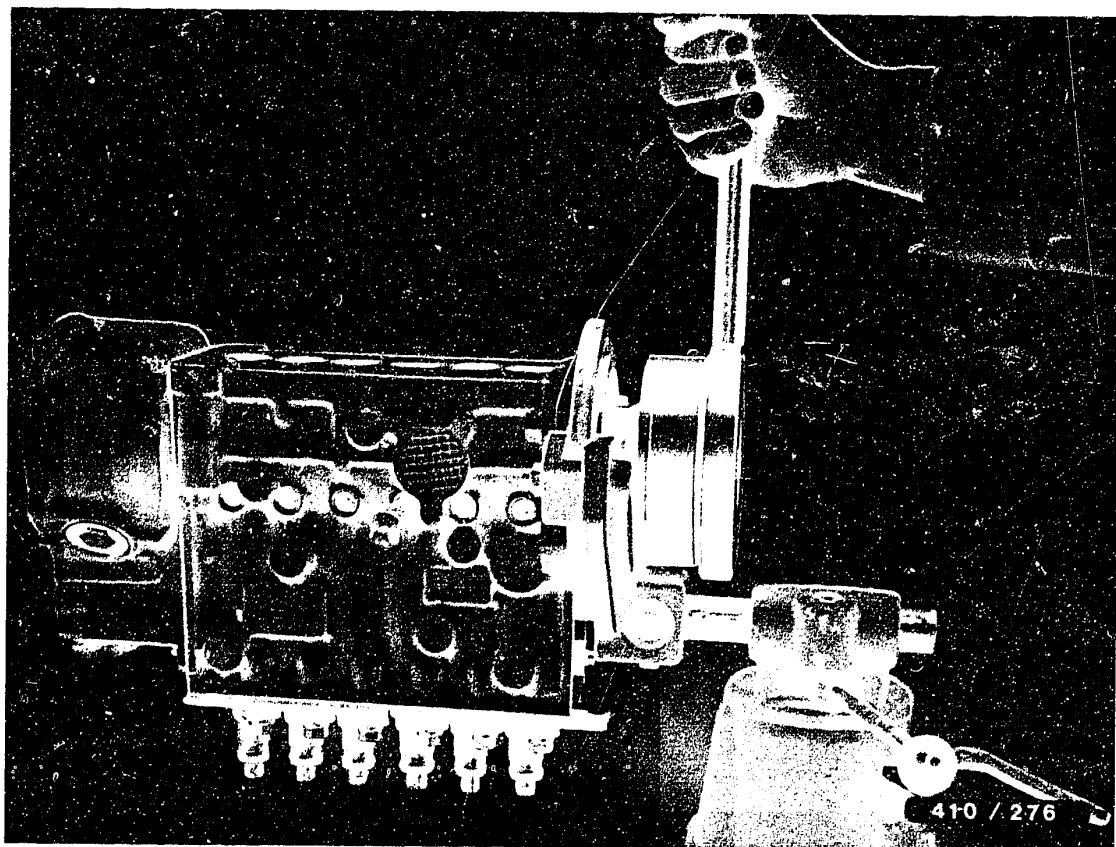
Remove end cover from device and throw away. Re-use is not allowable.

**B7**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800







Turn injection pump round so that the delivery-valve holders are pointing downward.

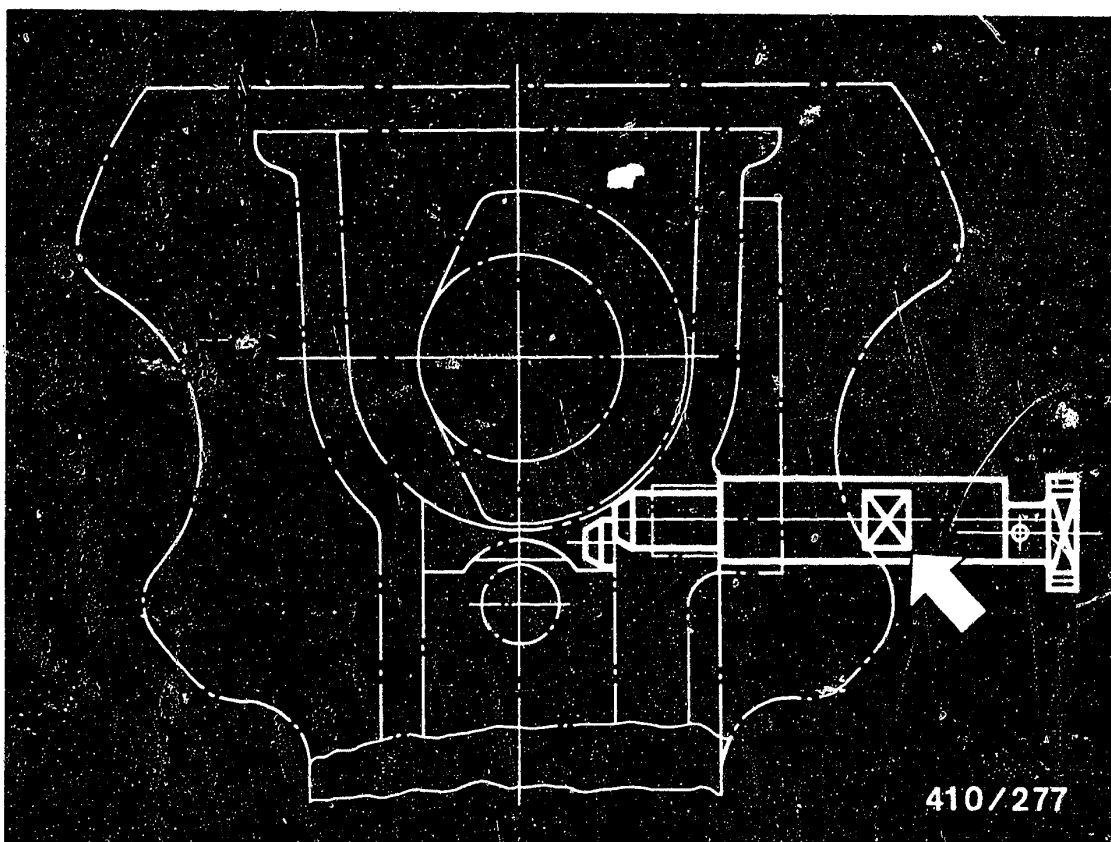
Position holding wrench KDEP 2885 or KDEP 1555 on the driving coupling.

If one of the tappet-raising bores is not covered by a roller tappet, immediately introduce a tappet holder KDEP 1553.

**B8**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Before introducing the tappet holders KDEP 1553, the respective roller tappet must be brought to TDC by turning the camshaft.

This opens the mounting hole in the pump housing for introducing the tappet holder.

Introduce tappet holder into the mounting hole until it comes up against the housing.

The "0" marks punched into the body of the device and punched into the end face of the modified handle point upward (toward center of camshaft).

The laterally milled faces (arrow) must under all circumstances be vertical.

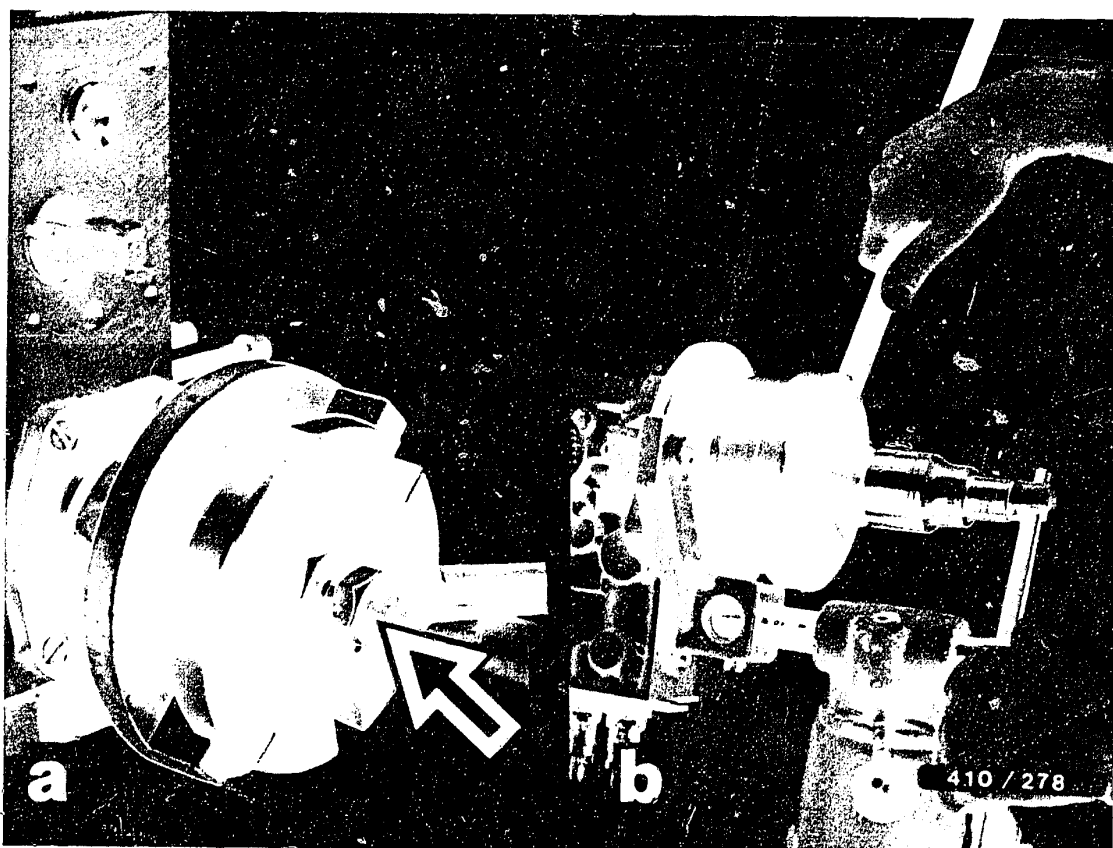
After introducing the tappet holder, turn the eccentric shaft through  $180^\circ$  with an open-end wrench AF 16. This lifts the roller tappet off the cam. Be sure to hold the sleeve of the tappet holder in order to prevent the sleeve from turning.

**B9**

Dismantle fuel-injection pump

PE(S).. P.. S 7100, S 7800





### Pulling off the drive coupling

Using holding wrench KDEP 2906 for slot width 10 mm and KDEP 2885 for 12 mm slot width, bring the drive coupling up against the clamping support (see picture a).

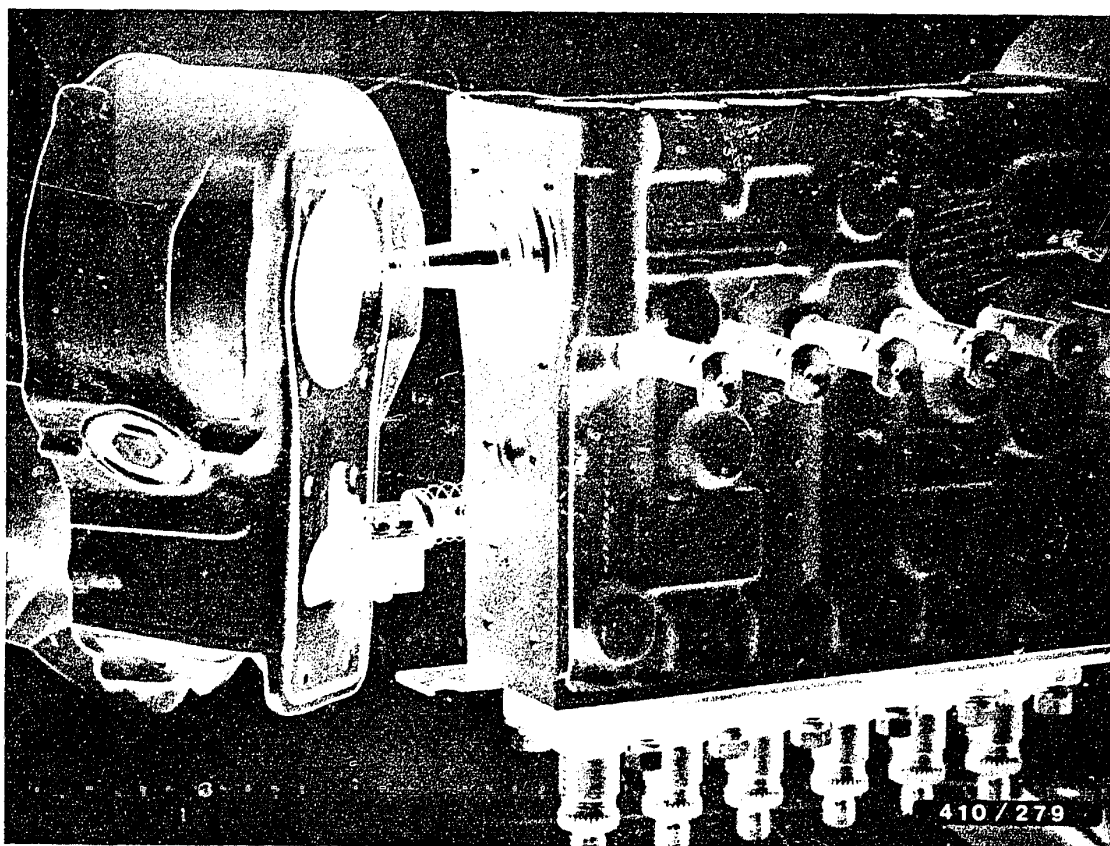
Screw appropriate puller (arrow) into drive coupling and pull drive coupling off camshaft.

In the case of pumps with drive flange on the camshaft, use three-part puller KDEP 1557 (picture b).

**B 10**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800



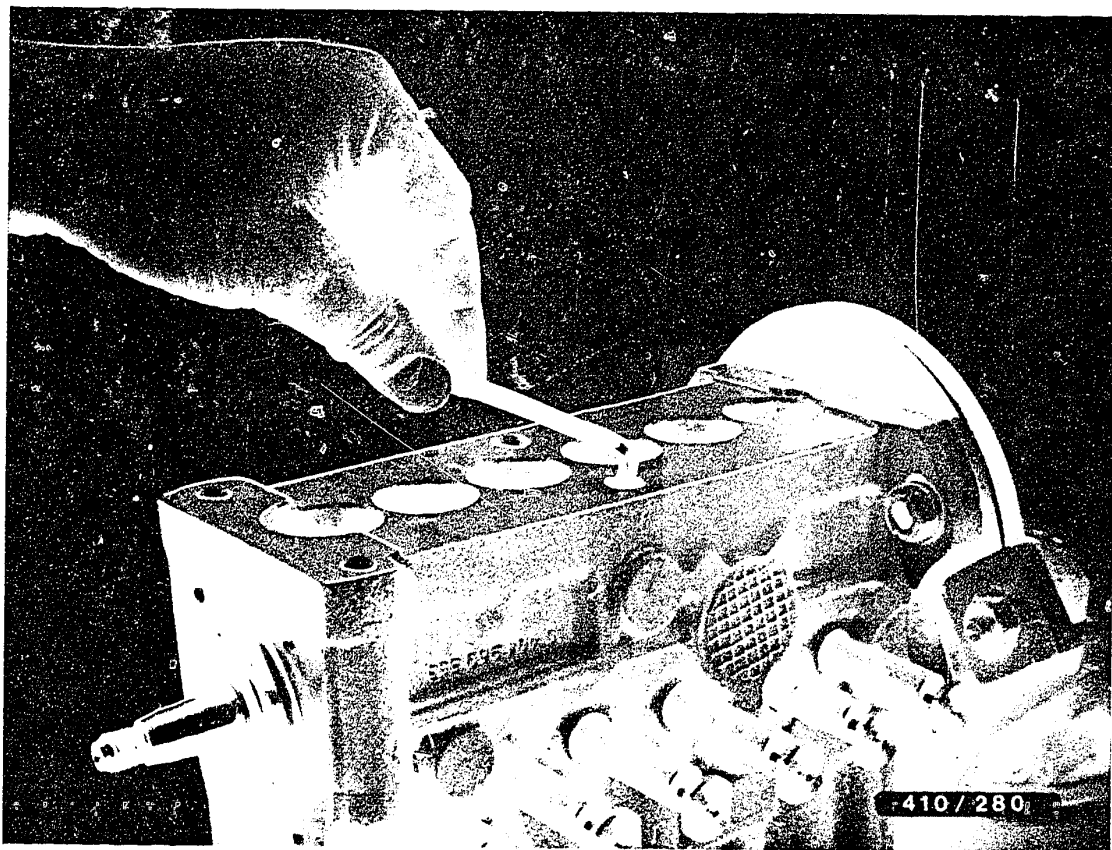


Loosen fastening screws of governor housing and unscrew.  
Take off governor housing. Remove gasket.

**B 11**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800



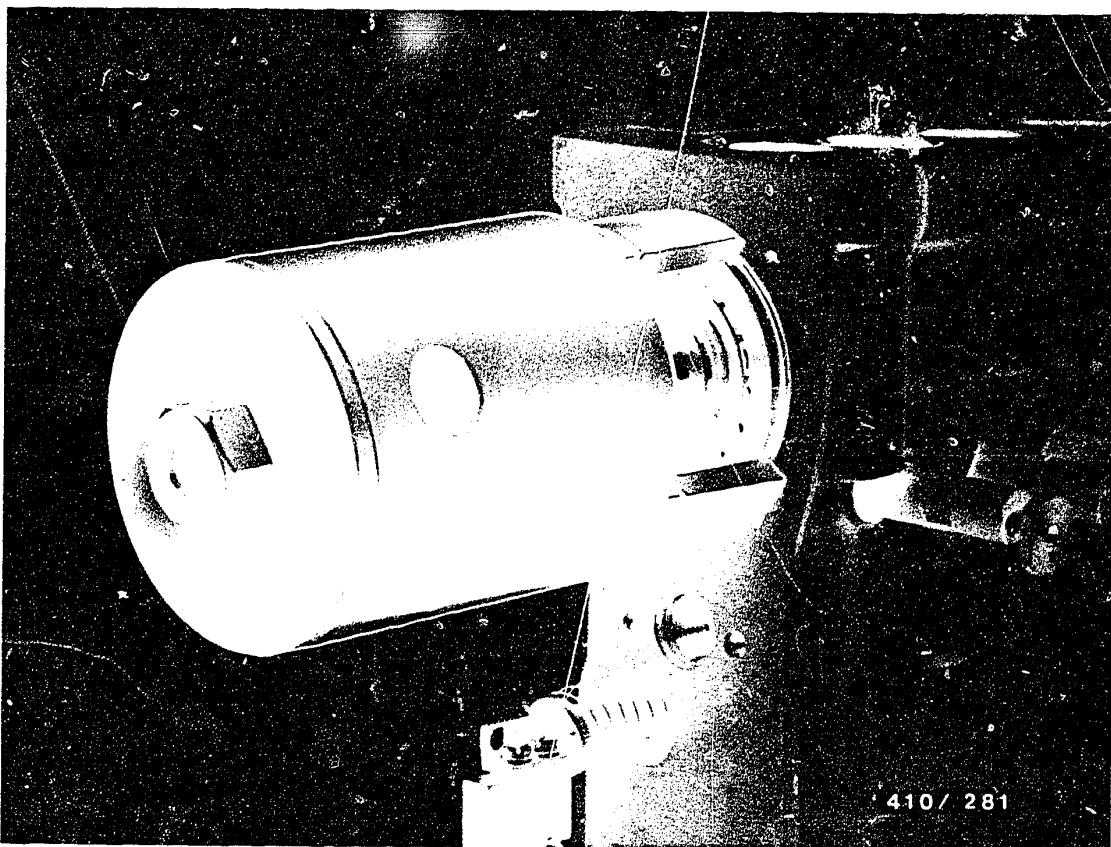


Loosen fastening screws of camshaft intermediate bearing and unscrew.

**B 12**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





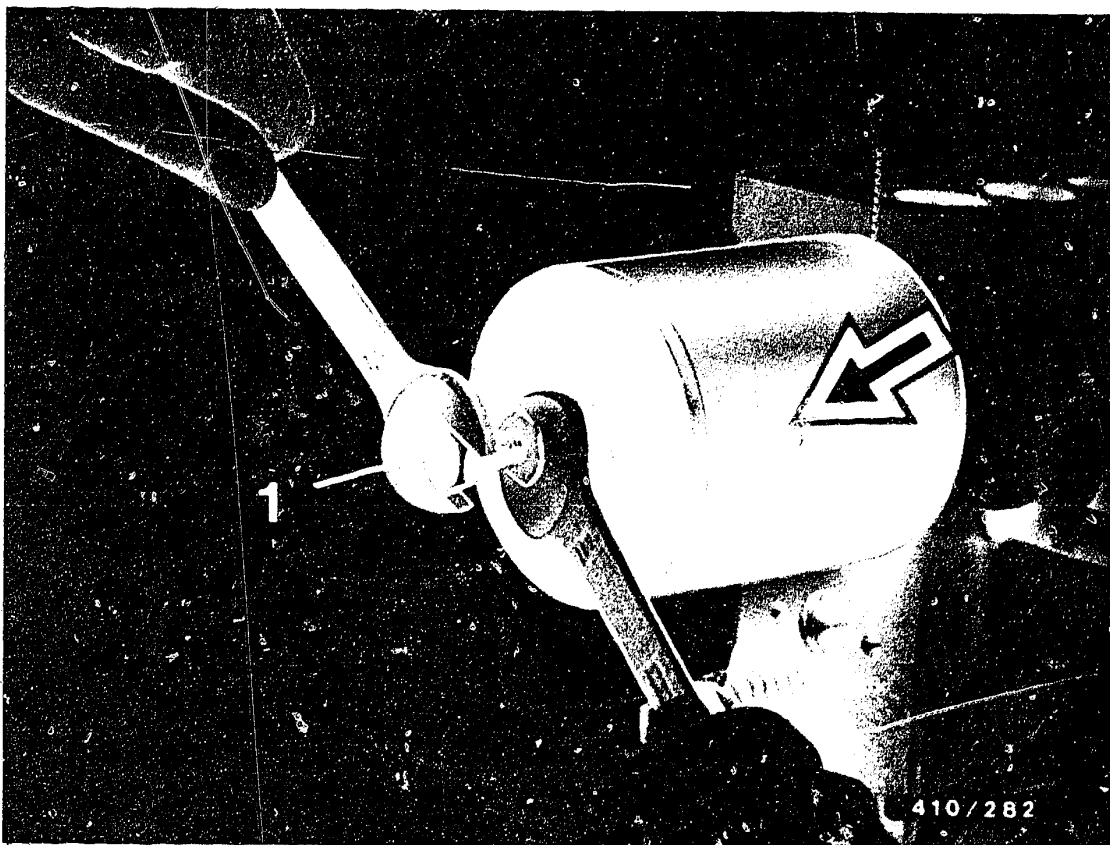
Insert two-part spring collet of puller KDEP 1569 into the annular groove of the outer race of the governor-end camshaft bearing.

Slide over bell of puller until it comes up against the pump housing.

**B13**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Stick puller screw with nut through the central bore of the bell of the puller KDEP 1569 and screw into the supporting plate of the inner collet (check through inspection hole in bell (arrow)).

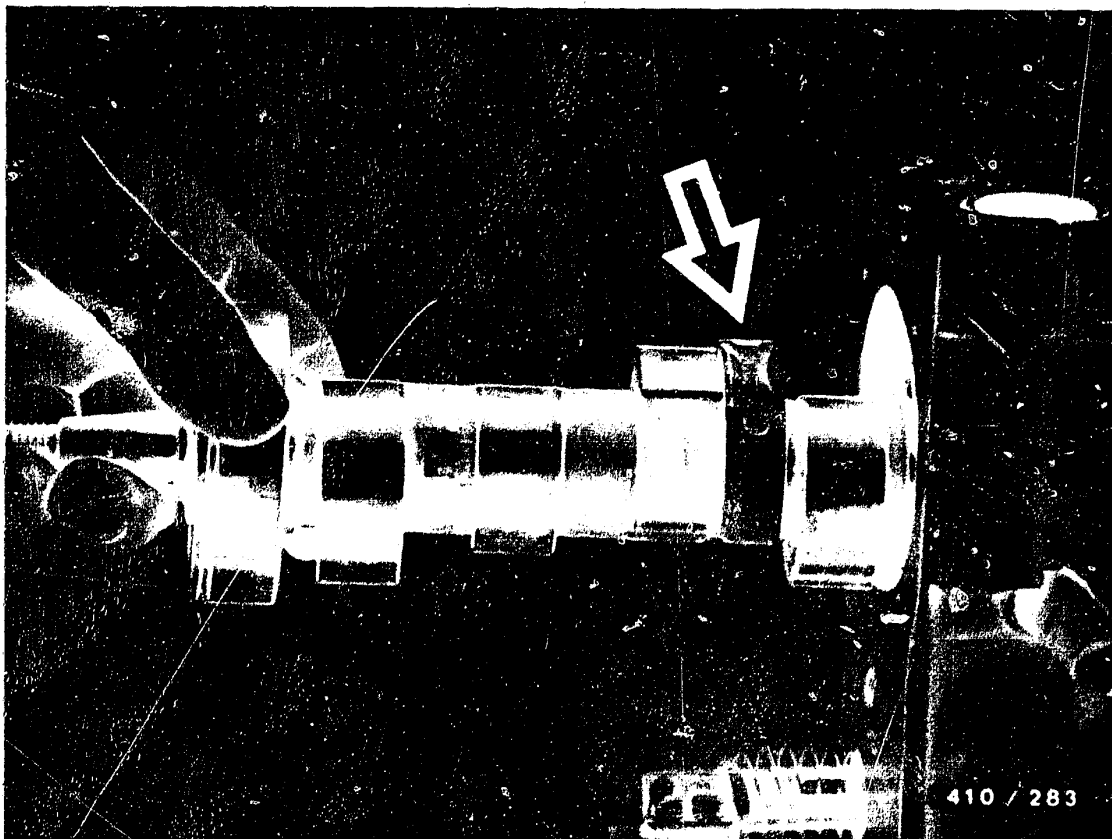
To withdraw the bearing with camshaft, hold the screw with an open-end wrench and turn the puller nut with a second open-end wrench (1).

**B14**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800







Remove puller KDEP 1569 from bearing as soon as the bearing has been pulled out of the pump housing.

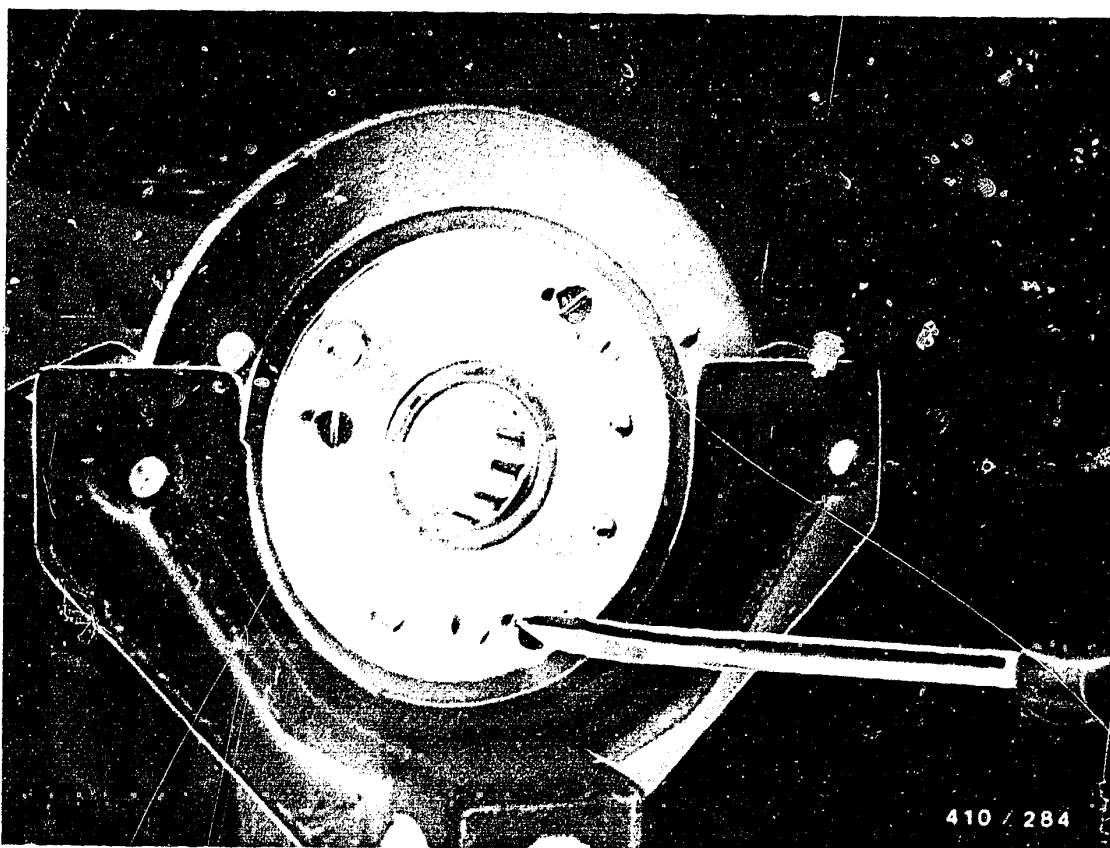
Carefully remove camshaft with bearing and intermediate bearing (arrow) from the pump.

Remove intermediate bearing from camshaft and set aside.

**B 15**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





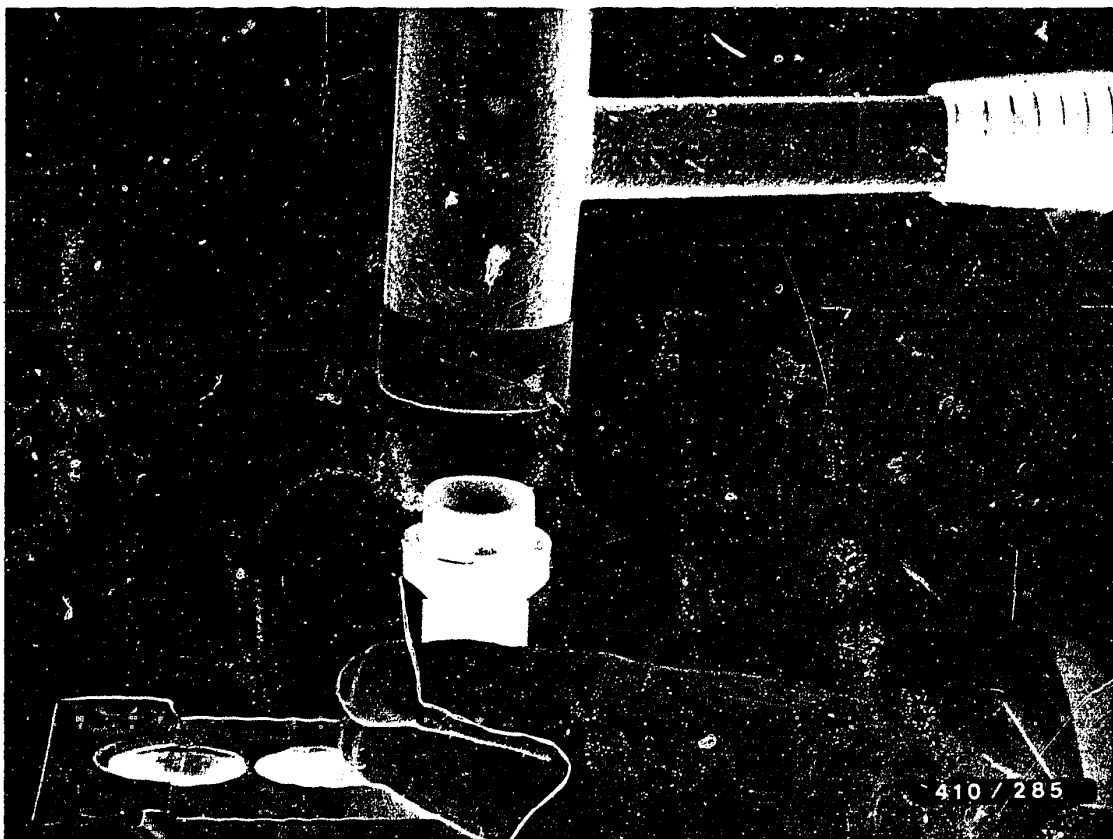
If the drive-end bearing cover has M 5 threaded holes, screw approx. 30 mm long screws into these.

To press out the bearing cover, the previously screwed-in forcing-off screws are alternately and uniformly turned further until the bearing cover can be removed from the pump housing.

**B 16**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Using press-in mandrel KDEP 1554, knock base end covers through into the camshaft chamber of the pump housing and remove.

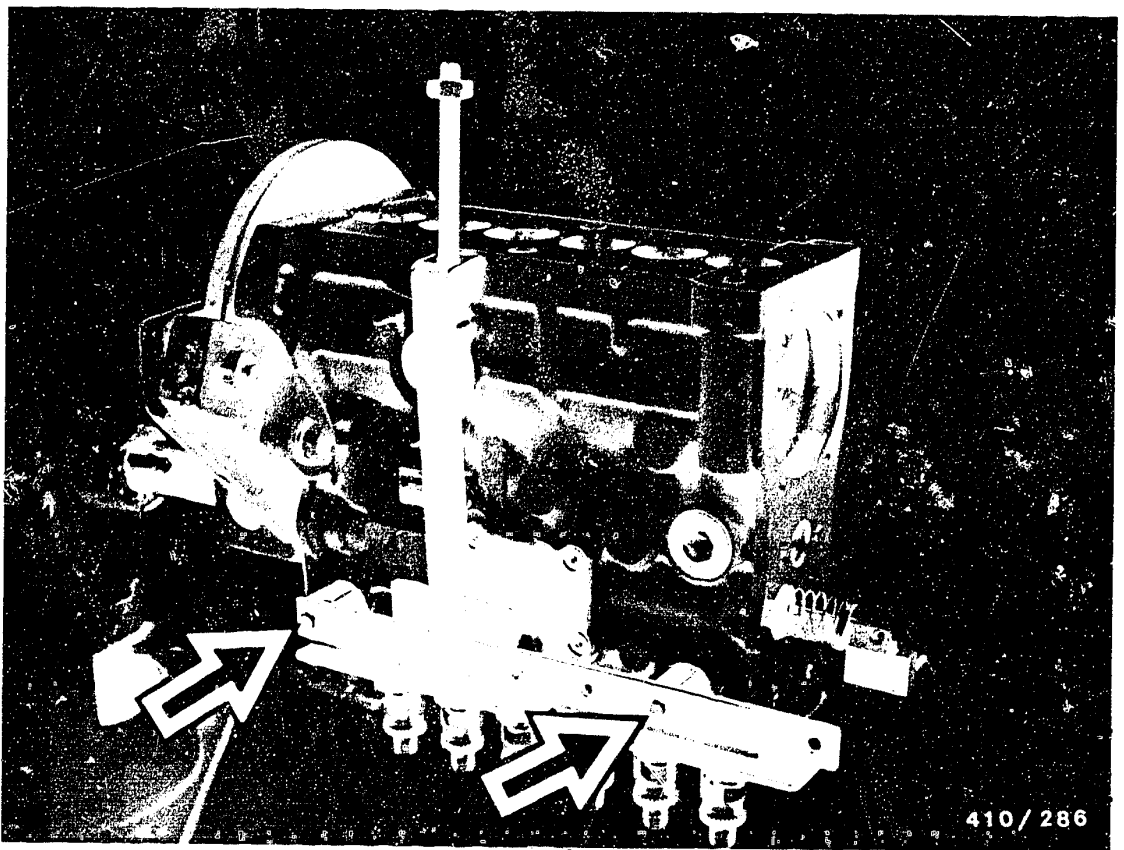
Note:

The base end covers are destroyed during this operation and must be replaced.

**B 17**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800



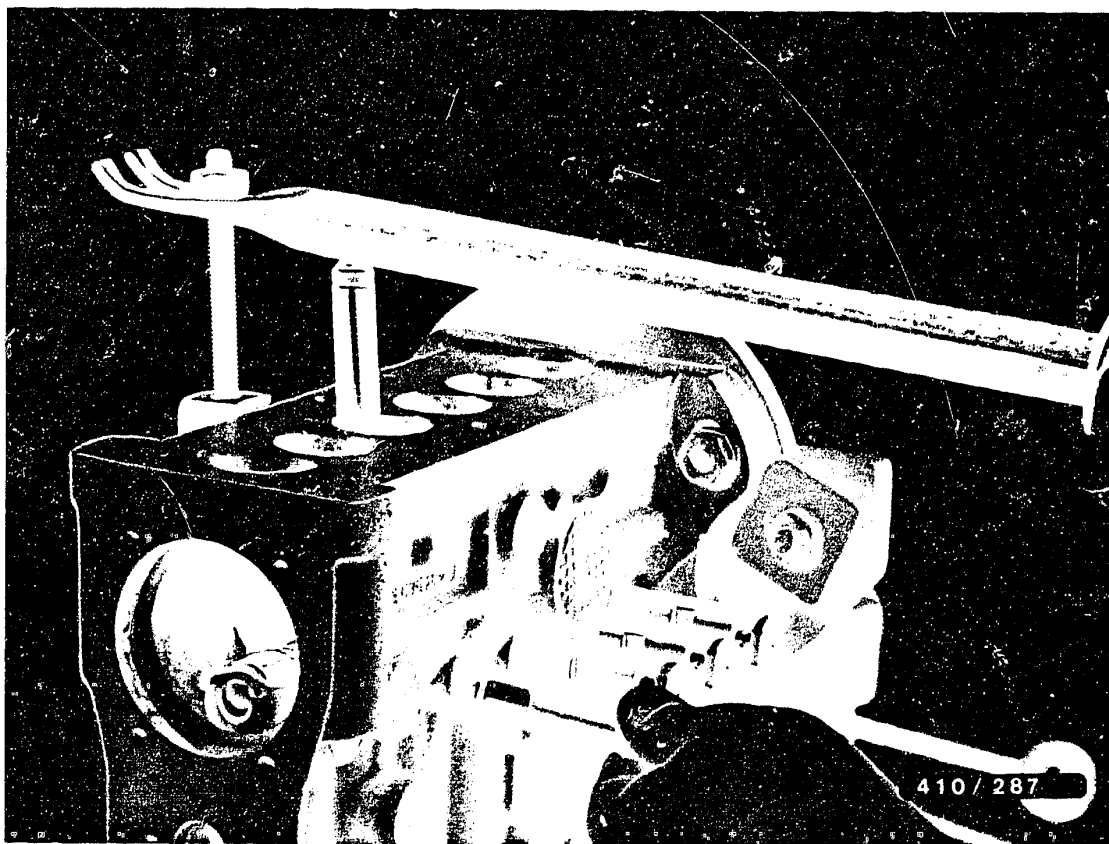


Mount mounting device KDEP 1556 on the pump housing.  
To do this, screw the fastening screws (arrows) into the  
threaded holes of the fuel inlet and return and tighten.

**B 18**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Stick pipe lever of mounting device KDEP 1505 onto the holding pin of mounting device KDEP 1556.

Place thrust pin on the roller of the first roller tappet and press lever downward as far as it will go.

Remove tappet holder KDEP 1553 and set aside.

Move pipe lever upward again and relax tappet spring.

This operation is repeated on each tappet of the pump.

Remove mounting device KDEP 1556.

**B19**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800



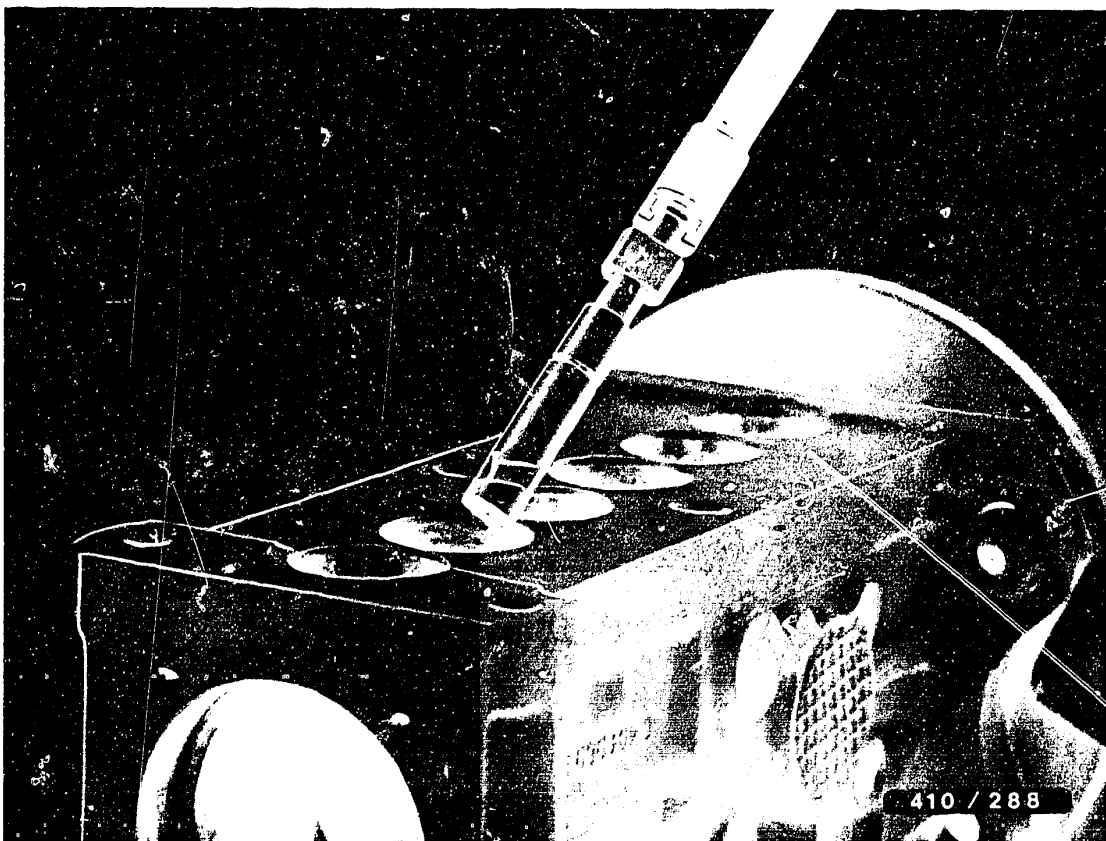
Remove roller tappet, tappet plate and spring seat from the respective tappet bore and take out through the camshaft chamber and the bearing-cover bore in the pump housing.

**B20**

Dismantle fuel-injection pump

PE(S).. P.. S 7100, S 7800





Using plunger pliers KDEP 1575, pull pump plunger out of pump barrel and set aside.

Warning:

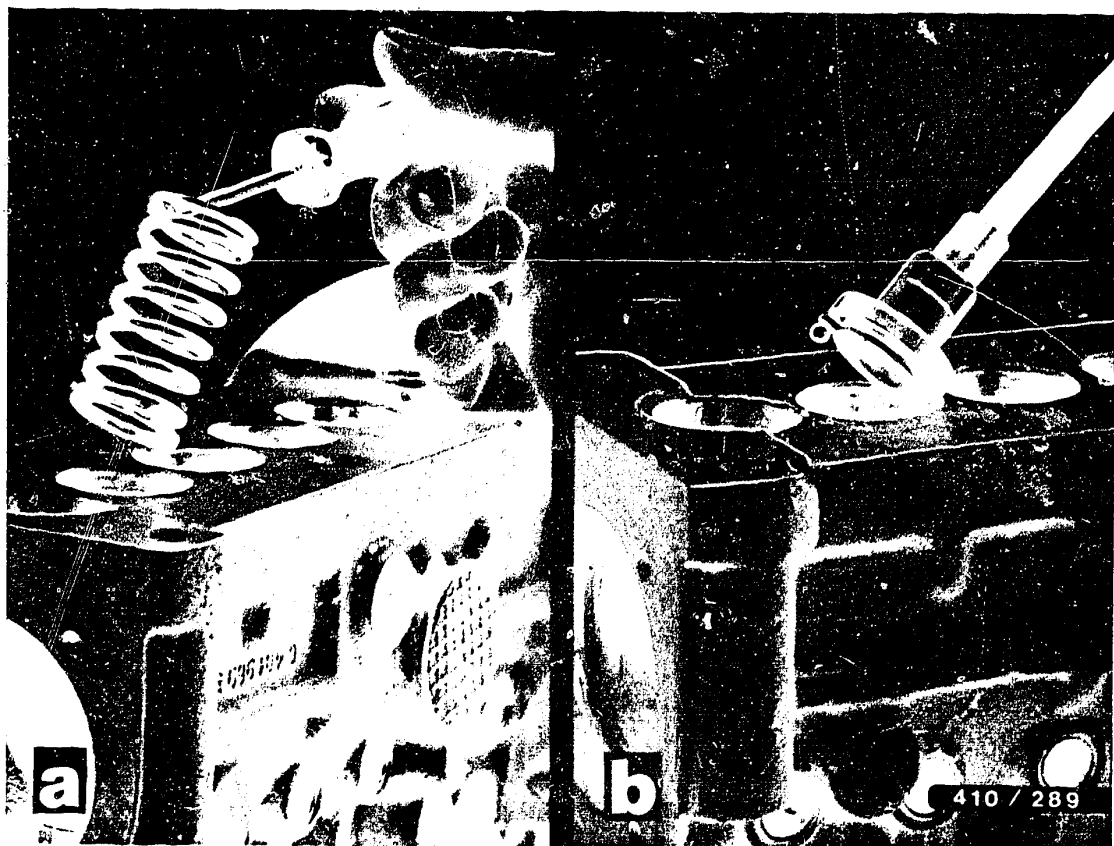
Pump plungers must not be mixed up, i.e. store all parts belonging to each barrel in separate compartments.

**B21**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





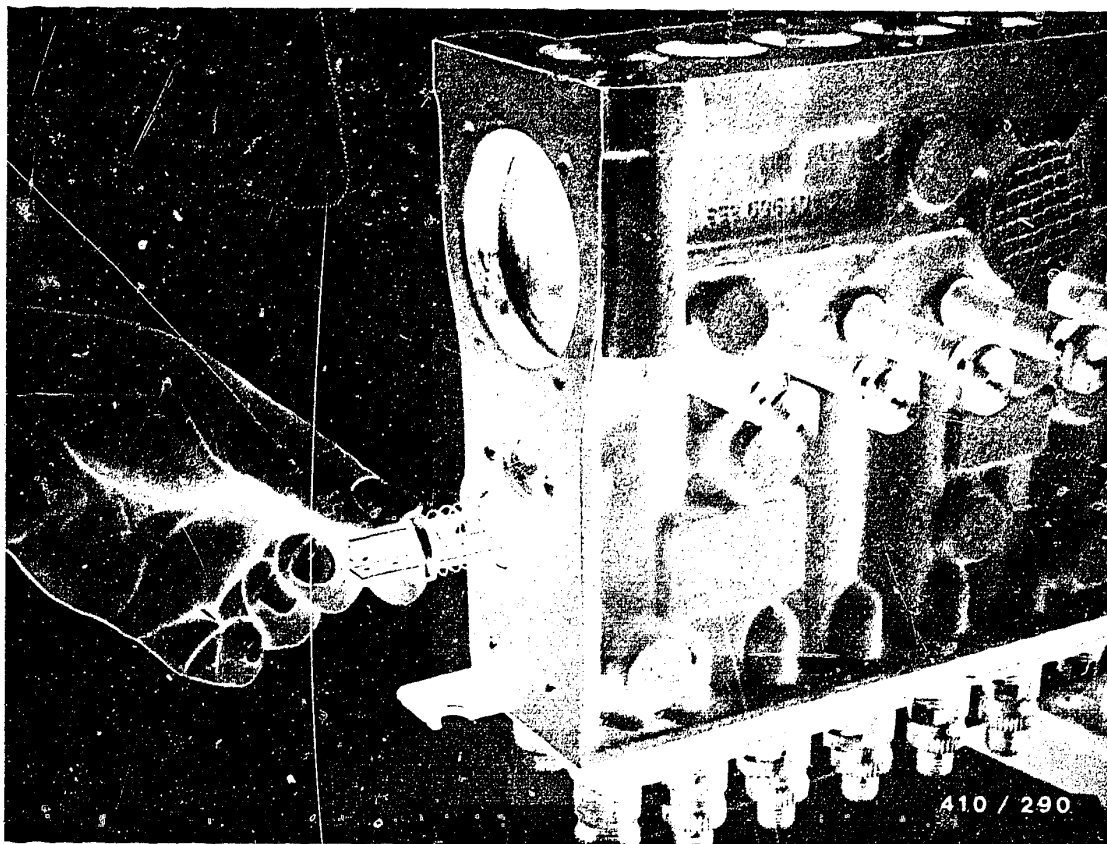


Using suitable tool, e.g. KDEP 2938, remove compression springs from tappet bores (picture a).

Using wrench KDEP 1071, remove control sleeve and upper spring seat (picture b - arrow).

Control rod must be in center position.

The projecting driver ball is in the housing recess for the roller tappet guide.

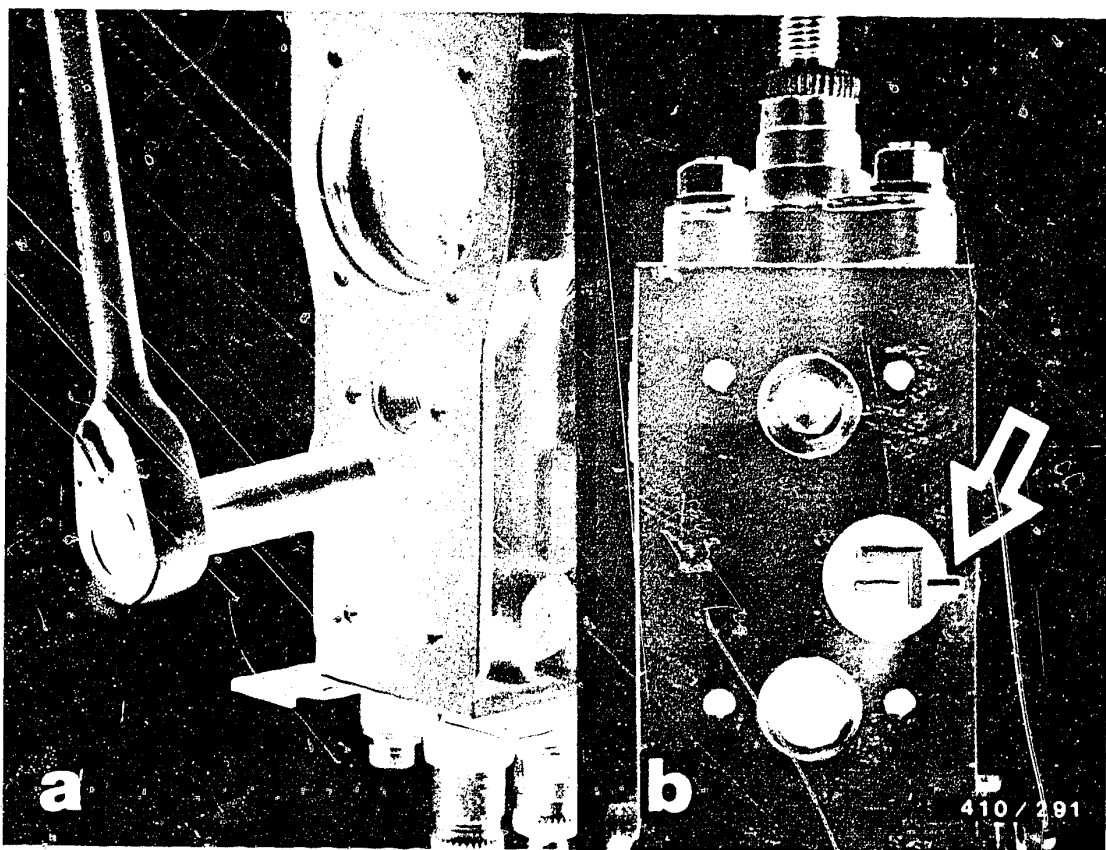


Remove spring seat and play-equalizing spring from the control rod on the governor end.

**B 23**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





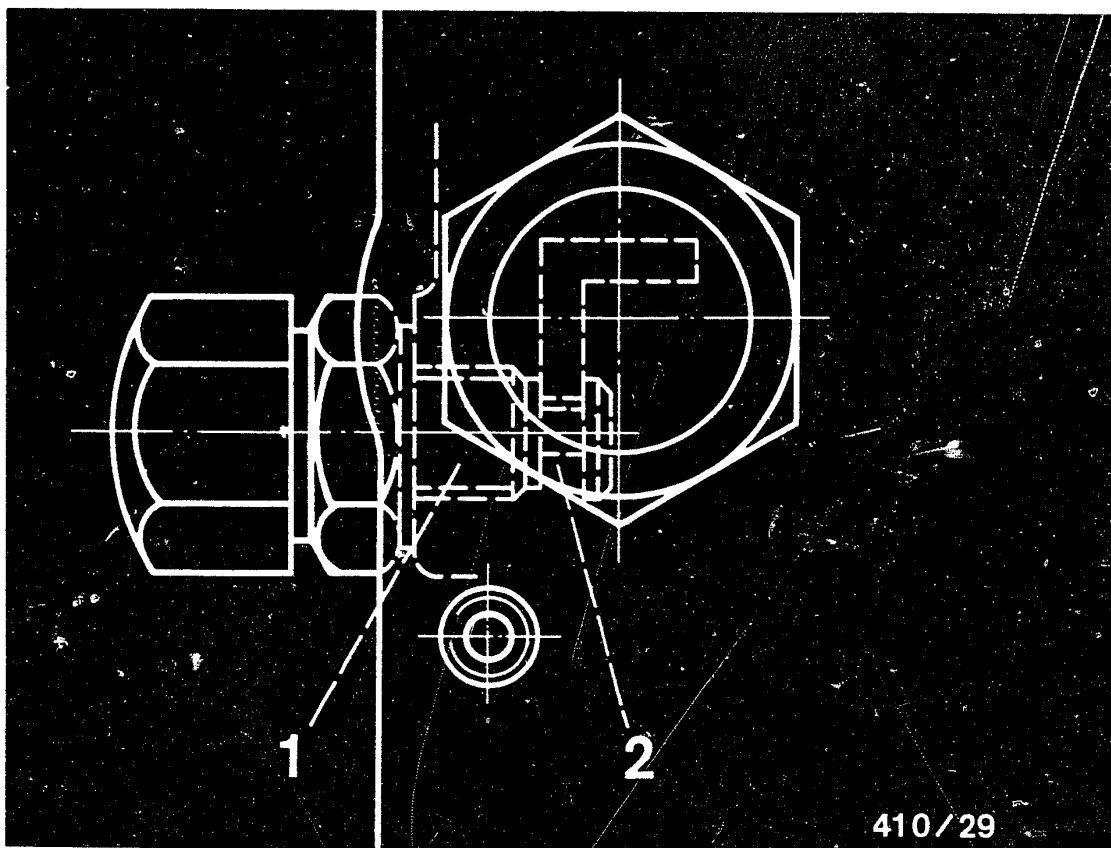
Unscrew threaded ring using pin-type socket wrench KDEP 1577 (picture a).

Remove locating pin (picture b - arrow).

Pull out control rod opposite drive end.  
Remove control rod screw plug at drive end and take out guide bushing.

Note:

If stuck, use long mandrel to knock out guide bushing opposite drive end.



- 1 = Control rod guide screw  
2 = Control rod guide

Remove control rod on 10- and 12-cylinder pumps

These injection pumps have additional control-rod guide screws (picture - Item 1).

These screws cannot be screwed out until after the control rod has been removed.

**C1**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800



Unscrew hexagon nuts of flange elements and remove spacer plates KDEP 1550 from under the flanges and set aside.

Place spacer sleeves KDEP 2911/3 on the supporting pins of puller KDEP 2911.

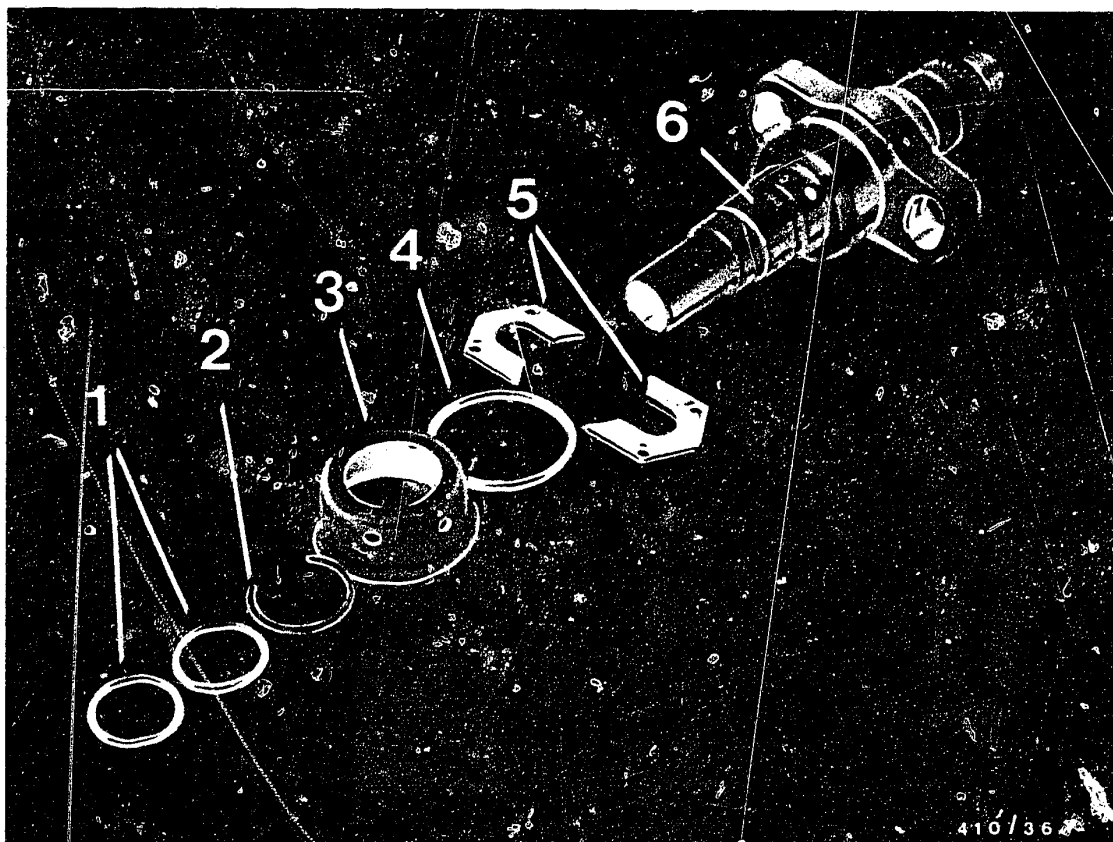
Using puller, remove barrel-and-valve assemblies from the pump housing.

Note:

When setting aside the barrel-and-valve assemblies, make sure to keep to the same sequence as when removing the pump plungers.

Pump plunger and the pump barrel contained in the barrel-and-valve assembly must not be mixed up.





- 1 = O-rings
- 2 = Retainer
- 3 = Capsule
- 4 = O-ring
- 5 = Split prestroke shim
- 6 = Plunger-and-barrel assembly

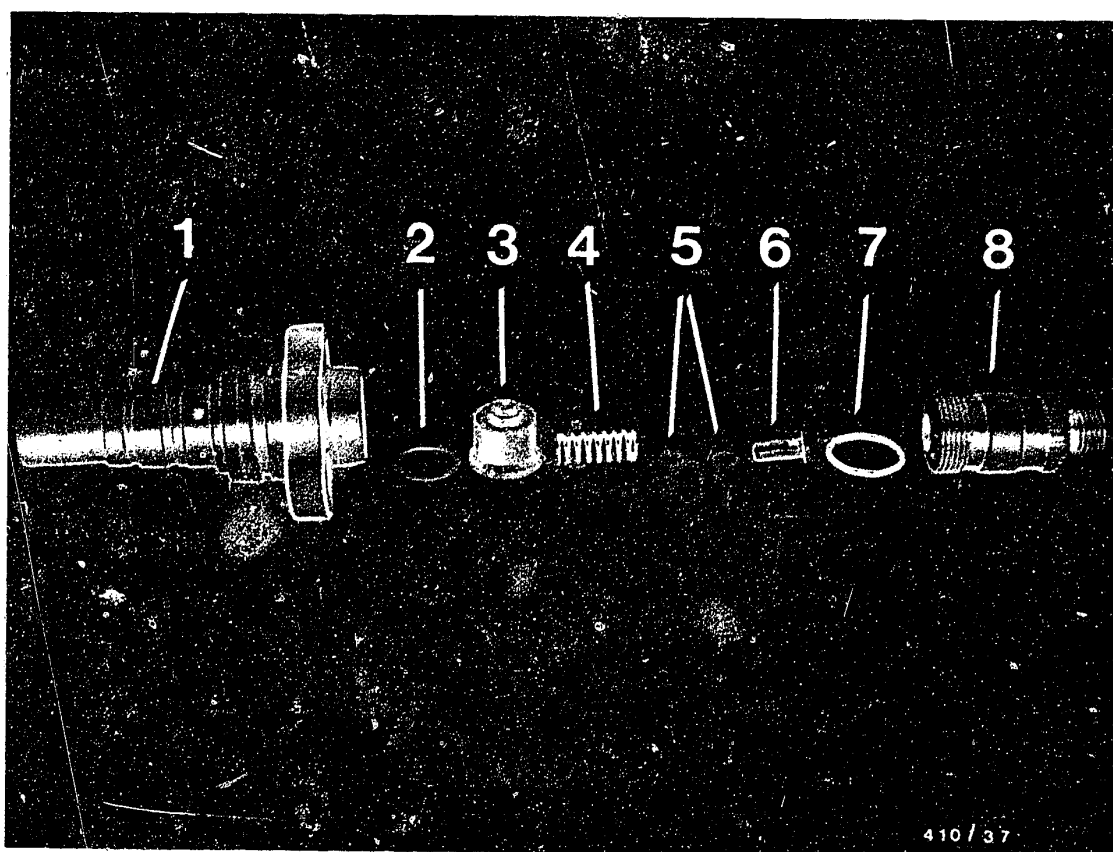
Dismantle the flange-type plunger-and-barrel assembly

Remove retainer from plunger-and-barrel assembly and  
take off capsule.  
Remove O-rings.

**C3**

Dismantle fuel-injection pump  
PE(S).. P.. S 7100, S 7800





- |                    |                           |
|--------------------|---------------------------|
| 1 = Pump barrel    | 5 = Shims                 |
| 2 = Gasket         | 6 = Filler piece          |
| 3 = Delivery valve | 7 = O-ring                |
| 4 = Valve spring   | 8 = Delivery-valve holder |

Position barrel-and-valve assembly in assembly device KDEP 2962.

Loosen delivery-valve holder with socket wrench KDEP 2986 and unscrew.

Remove O-ring from delivery-valve holder.

Take off valve spring with filler piece from delivery valve.

Take delivery valve with gasket out of pump barrel.

**C4**

Dismantle fuel-injection pump

PE(S).. P.. S 7100, S 7800



## 7. Cleaning the parts

Wash the parts in low-inflammability, commercially available cleaning agent, e.g. Chlorothene NU.  
Then blow off with compressed air.

### Observe the following safety regulations.

Decree on Working with Combustible Liquids (Vbf) issued by the Federal Ministry of Labor (BmA).

Safety rules for handling chlorinated hydrocarbons  
for the workshop ZH 1/222

for the employee ZH 1/119

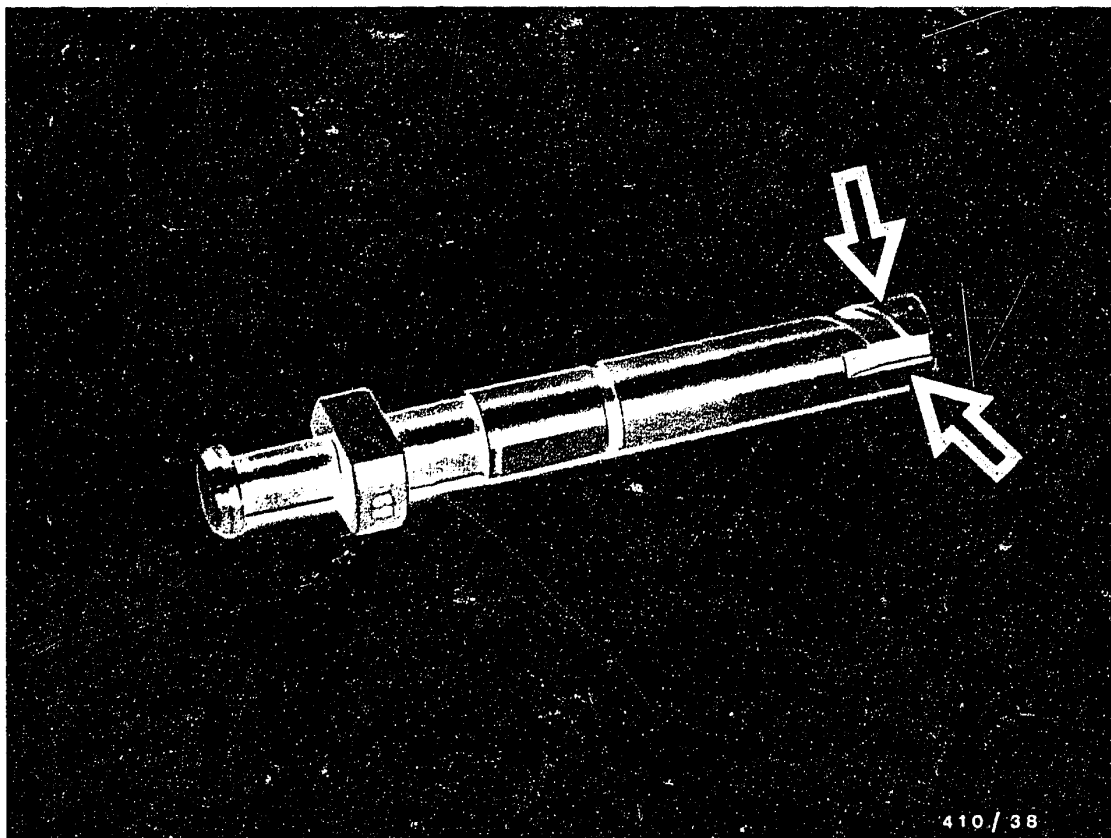
issued by the Central Association of German Employers' Liability Insurance Associations (Central Association for Accident Prevention and Industrial Medicine)  
Langwartweg 103, D-5300 Bonn 5.

In countries outside the Federal Republic of Germany, observe the corresponding local regulations.

Threaded mounting holes in the pump housing for intermediate bearing and governor housing must be recut with thread cutter, washed out and blown out.





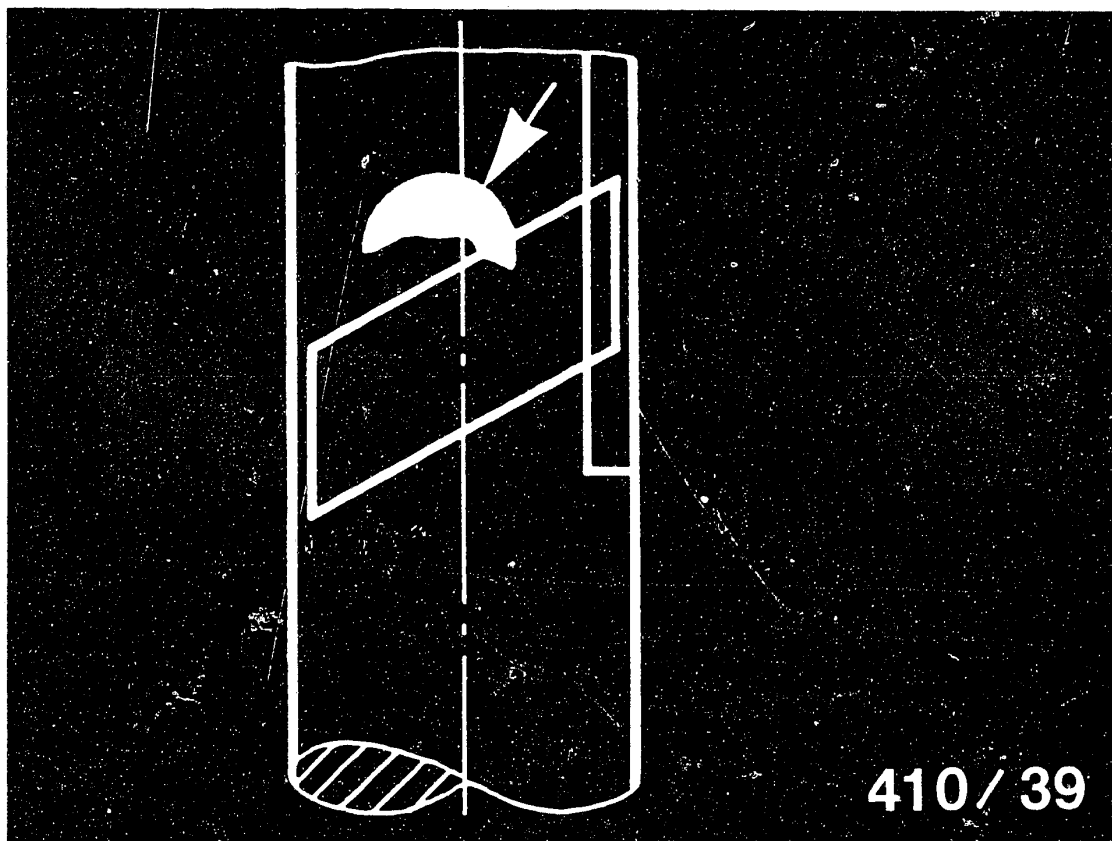


#### 8. Checking the individual components - Assessing for wear

Worn or damaged components must be replaced. Gaskets and O-rings must always be replaced. Pay particular attention to helixes on the pump plungers. The helixes must be sharp-edged and must not be rounded (arrows).

The bearing surfaces must not show any traces of wear or scoring.



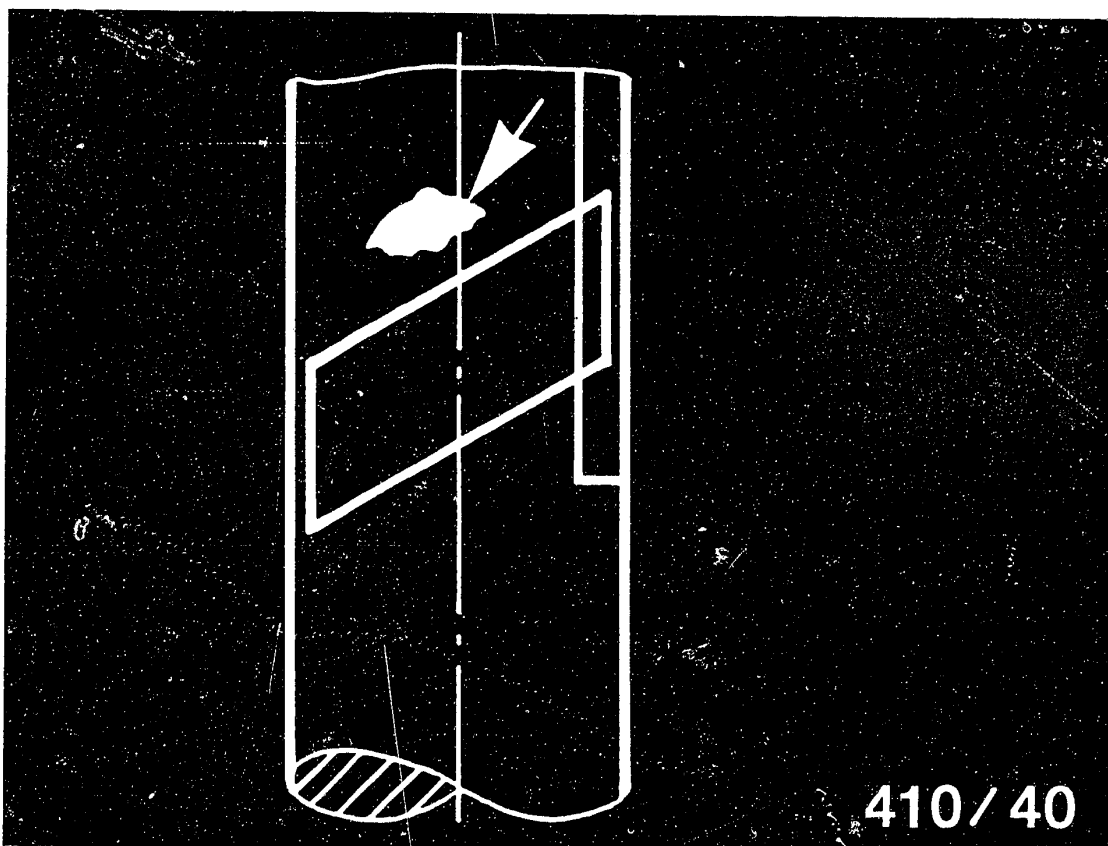


To rule out any uncertainty when assessing plunger-and-barrel assemblies, note the following:  
Replacement of the plunger-and-barrel assemblies is justified in the case of:

- Cavitation (material erosion) in the region of the helixes (see picture, arrow).
- Seizing or sticking of plunger as a result of dirt or surface coatings - detectable by glide test - plunger in barrel.

Note:

Before the glide test, wash out the pump plunger and barrel in calibrating oil. Hold pump plunger and barrel more or less vertical. Pump plunger must glide in barrel under its own weight.

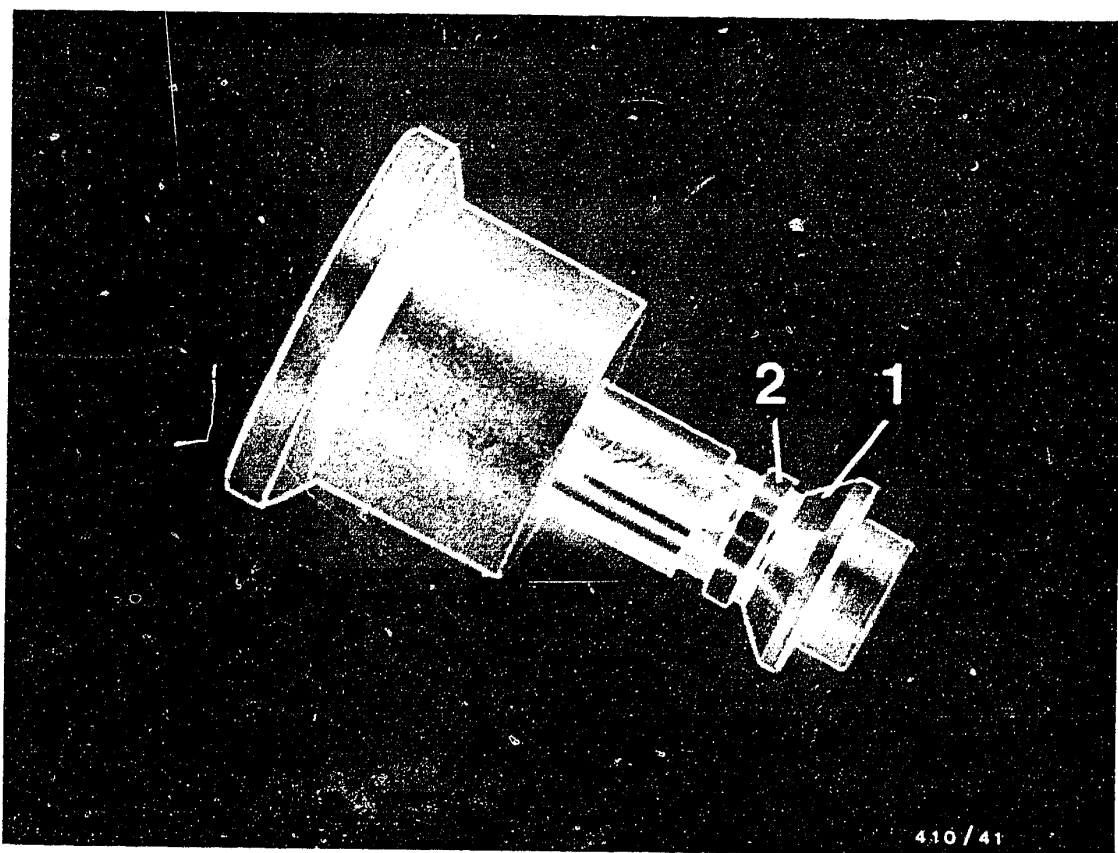


Replacement of the plunger-and-barrel assemblies is not justified in the case of:

- Cavitation (material erosion) above the helix (see picture, arrow).
- Dull patches over the entire circumference
- Bright bearing marks (without scoring and without mechanical wear)
- Discoloration on plunger and flange-type barrel as a result of fuel and lubricant deposits, water in fuel or influence of temperature.

Note:

When repairing, do not as a basic rule replace plunger-and-barrel assemblies and delivery valves separately.



1 = Valve cone

2 = Retraction piston

### Checking the delivery valves

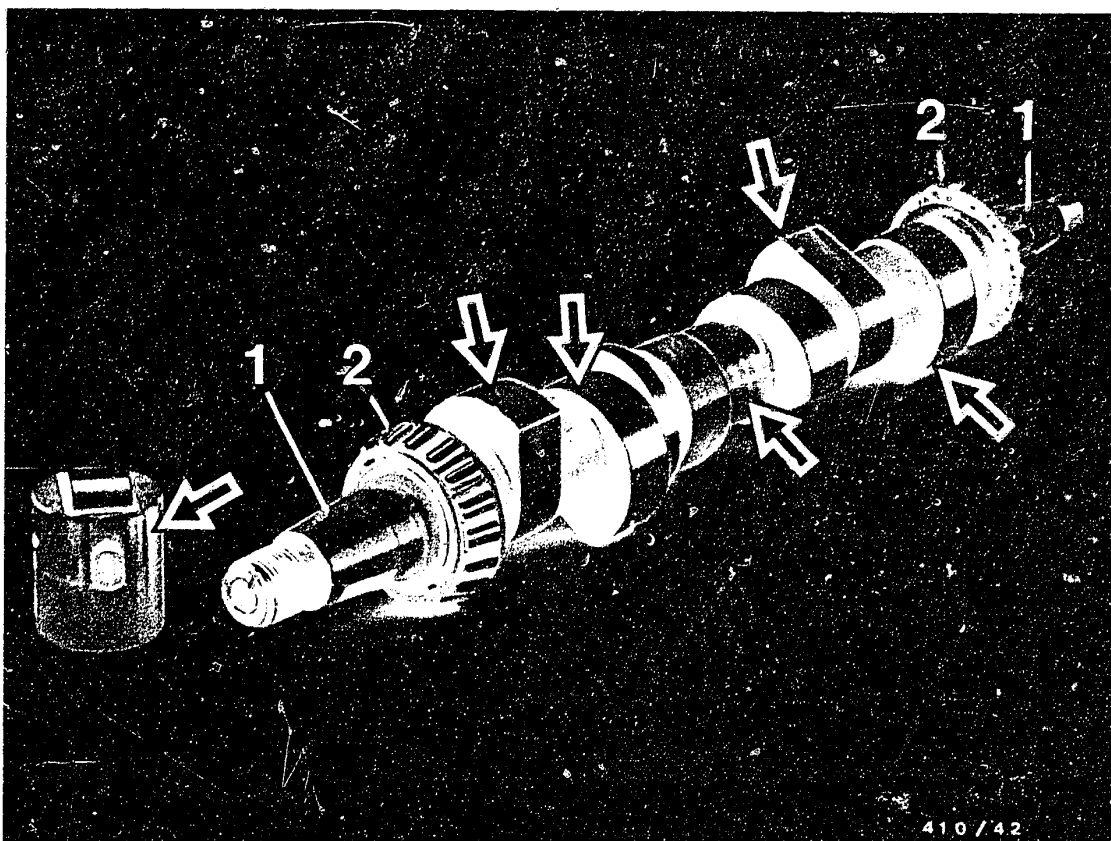
The seating surface of the valve cone must not be knocked in, must not have any cavitation and must not be unevenly worn.

If the retraction piston is damaged, or if the valve is sticking in the valve holder, replace the delivery valve.

**C9**

Checking the individual parts  
PE(S).. P.. S 7100, S 7800





1 = Cone

2 = Camshaft bearing

If the camshaft has heavy wear marks (arrows) or if a cone exhibits damage, replace camshaft.

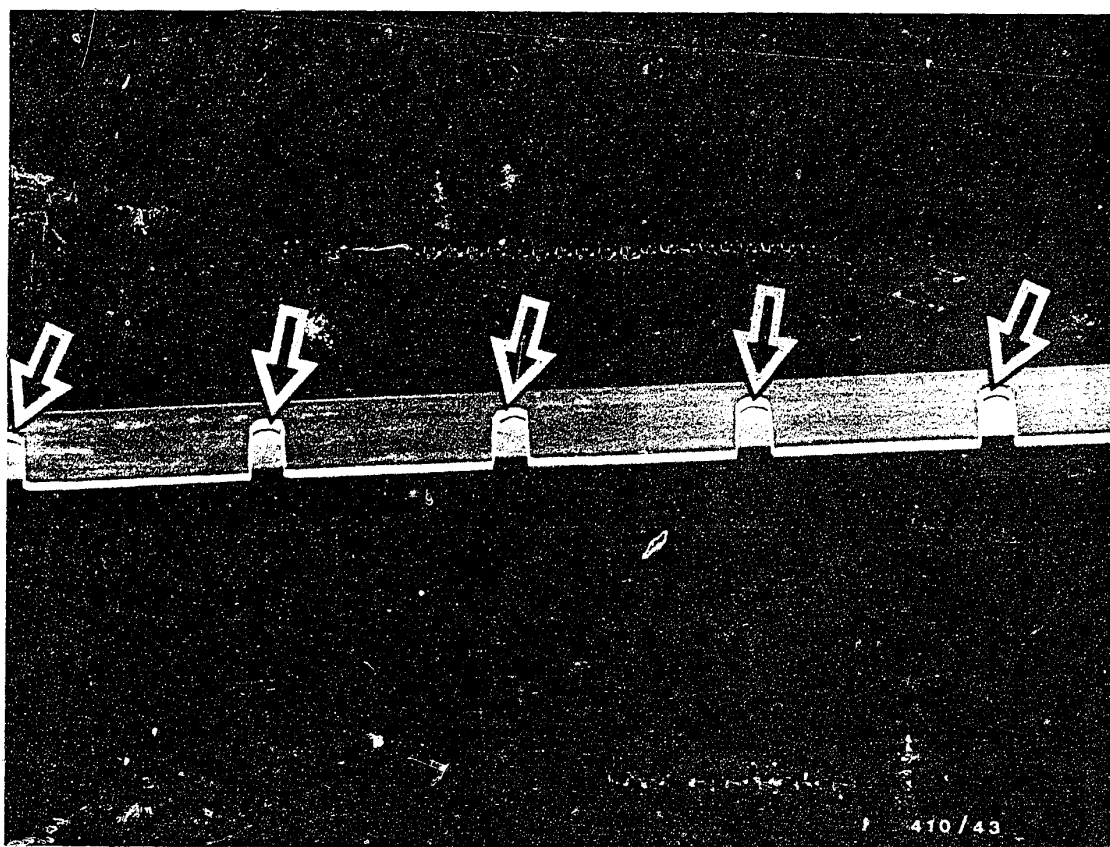
If there are signs of wear on the roller tappet, replace this, too.

The replacement of roller tappets must in any case result in the replacement of the camshaft.

Replace intermediate bearings that have wear marks.

Always replace gaskets, seal rings and O-rings when repairing.

Insofar as the governor-end camshaft bearing is removed, it must be replaced.



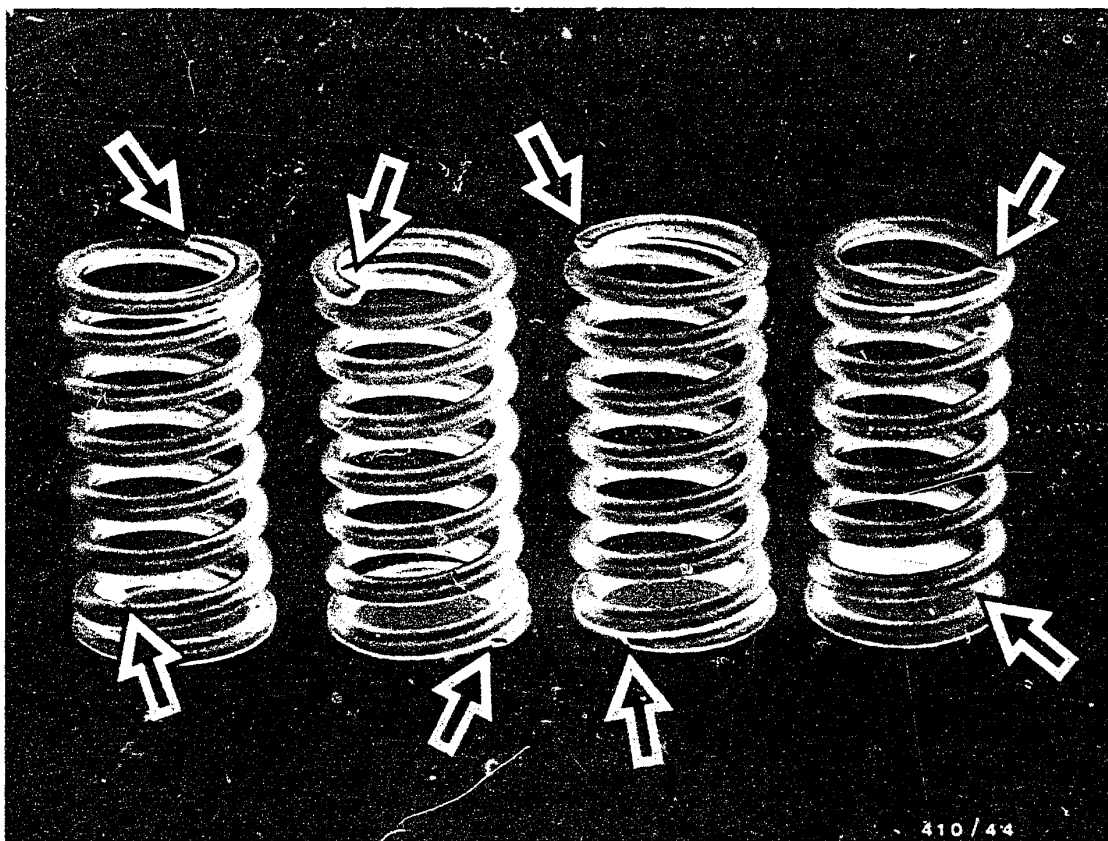
Check the control rod for worn grooves (see picture, arrows) (drivers of control sleeve).

**C11**

Checking the individual parts

PE(S).. P.. S 7100, S 7800





### Checking the plunger springs

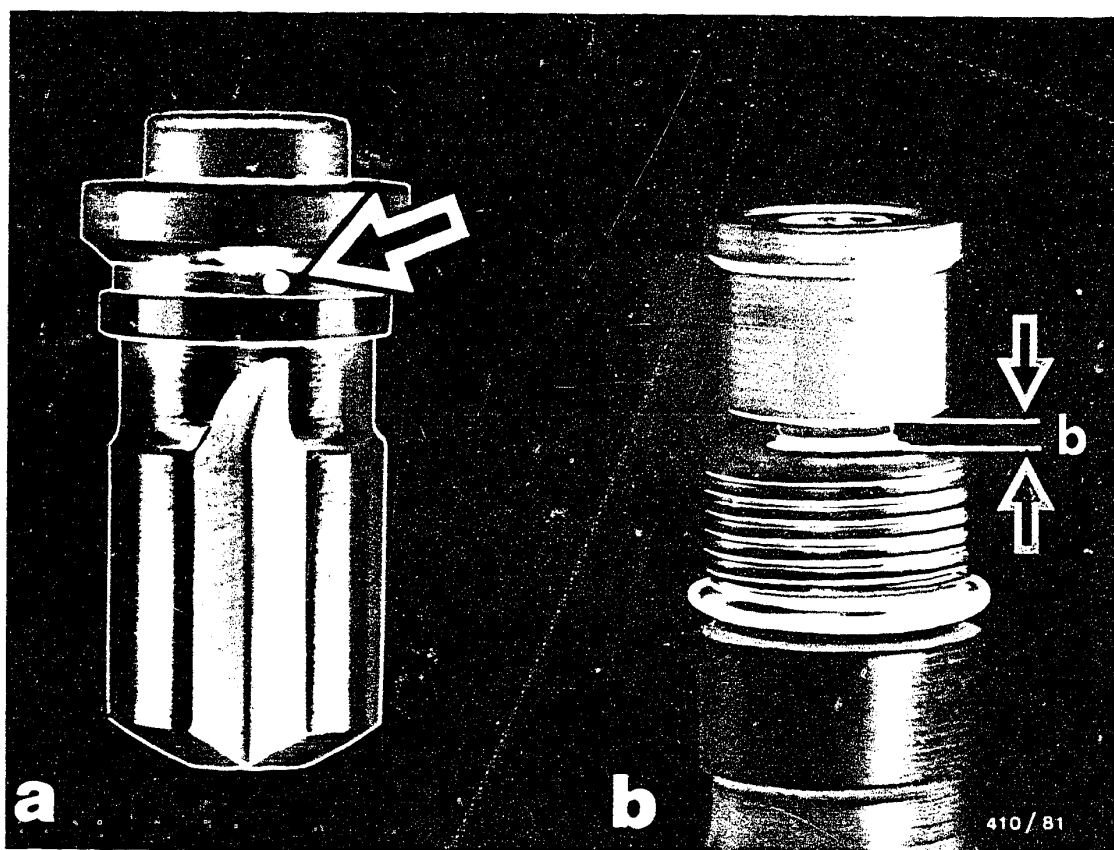
Plunger springs which are corroded or whose surface is damaged must be replaced due to the danger of breakage. Check in particular the area of the seating surface of the 1st turn (see picture, arrows).

**C12**

Checking the individual parts

PE(S).. P.. S 7100, S 7800





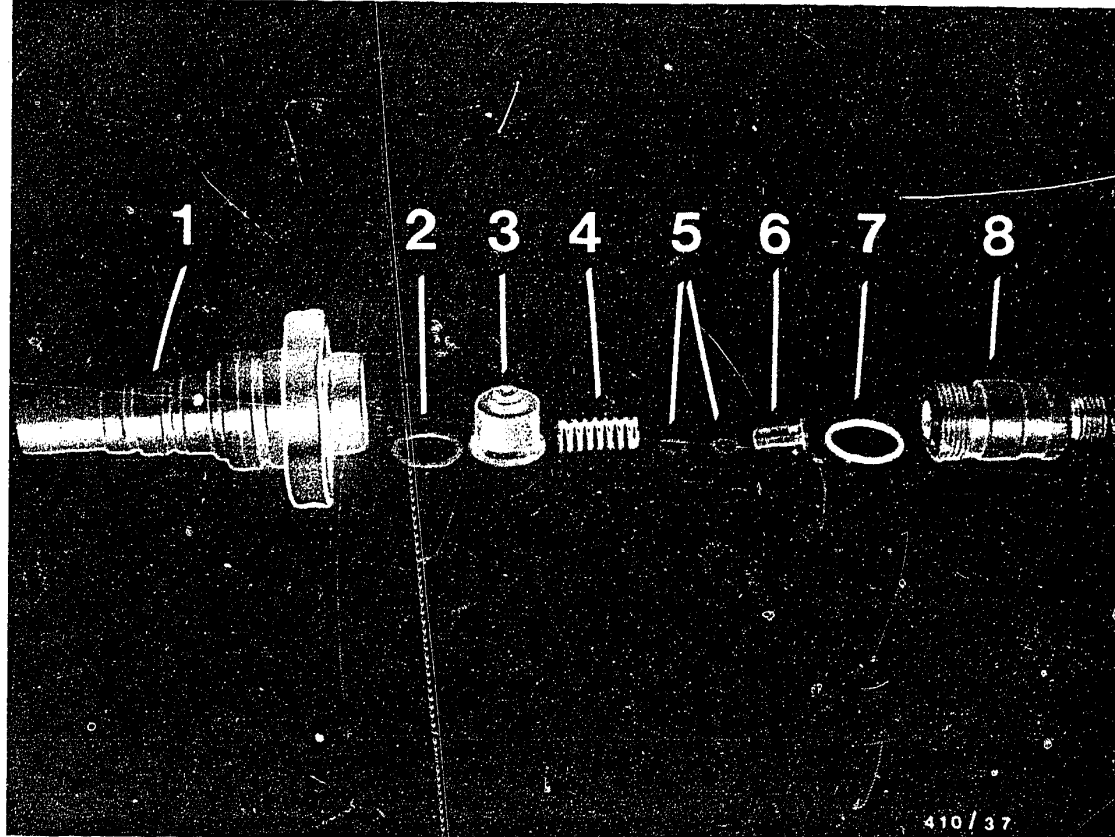
### 9. Setting the spring preload of torque-control delivery valves

Torque-control delivery valves can be identified by the idle bore (see picture a, arrow).

Check the spring preload as follows:

- Clamp delivery-valve holder in vise with spring chamber at top.
- Insert filler piece (if applicable) and compression spring.
- Mount delivery valve with valve holder and seal ring.
- Measure dimension "b" (see picture b). If the dimension for the spring preload given in the test-specification sheet is not obtained, add washers. If the dimension is too great, change washers or replace compression spring, as appropriate.





- |                    |                           |
|--------------------|---------------------------|
| 1 = Pump barrel    | 5 = Shim                  |
| 2 = Bronze gasket  | 6 = Filler piece          |
| 3 = Delivery valve | 7 = O-ring                |
| 4 = Valve spring   | 8 = Delivery-valve holder |

#### 10. Assembling the flange-type plunger-and-barrel assembly

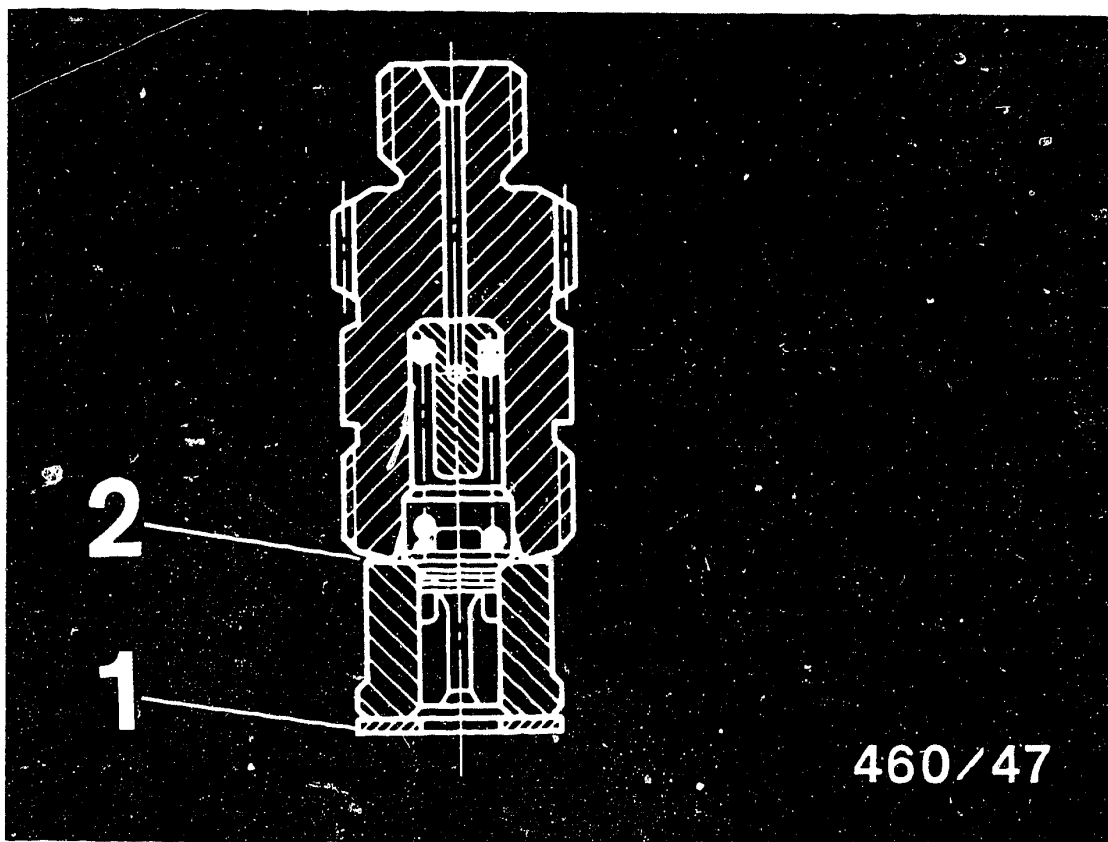
Insert bronze gasket, delivery valve and valve spring with filler piece (if applicable) with shims in pump barrel.

#### Note:

Bronze gasket must be installed between pump barrel and delivery valve.

Provide delivery-valve holder with O-ring and wet male thread with oil-tallow mixture (5 963 340 105). Then tighten to 110-120 Nm with socket wrench KDEP 2962.





- 1 = Bronze gasket  
2 = Delivery-valve biting edge

Note:

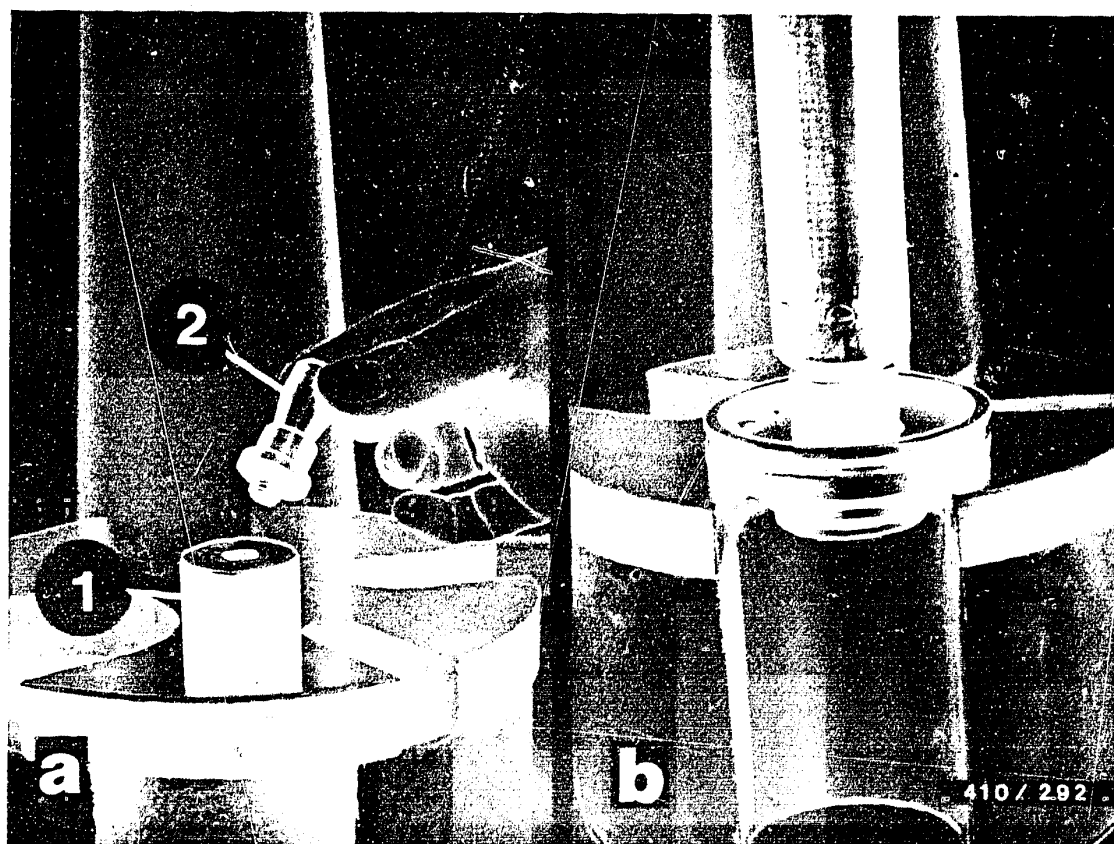
Whenever the delivery-valve holder has been loosened (e.g. when replacing the valve), replace the bronze gasket between valve holder and barrel.

Check for surface defects in gasket and in biting edge of delivery-valve holder.

In case of score marks and scratches, replace the parts concerned.

Briskly tighten the delivery-valve holder to a torque of 110 - 120 Nm.

Do not loosen and re-tighten.



## 11. REPLACE CAMSHAFT BEARING

The cylindrical-roller bearing in the drive-end bearing cover is removed in different ways, depending on the bearing diameter:

11.1 With bearing diameter 30 mm the complete bearing is pressed out of the bearing cover using press-out mandrel KDEP 1972 (1) in conjunction with mounting pin KDLJ 6010 (2) (picture a).

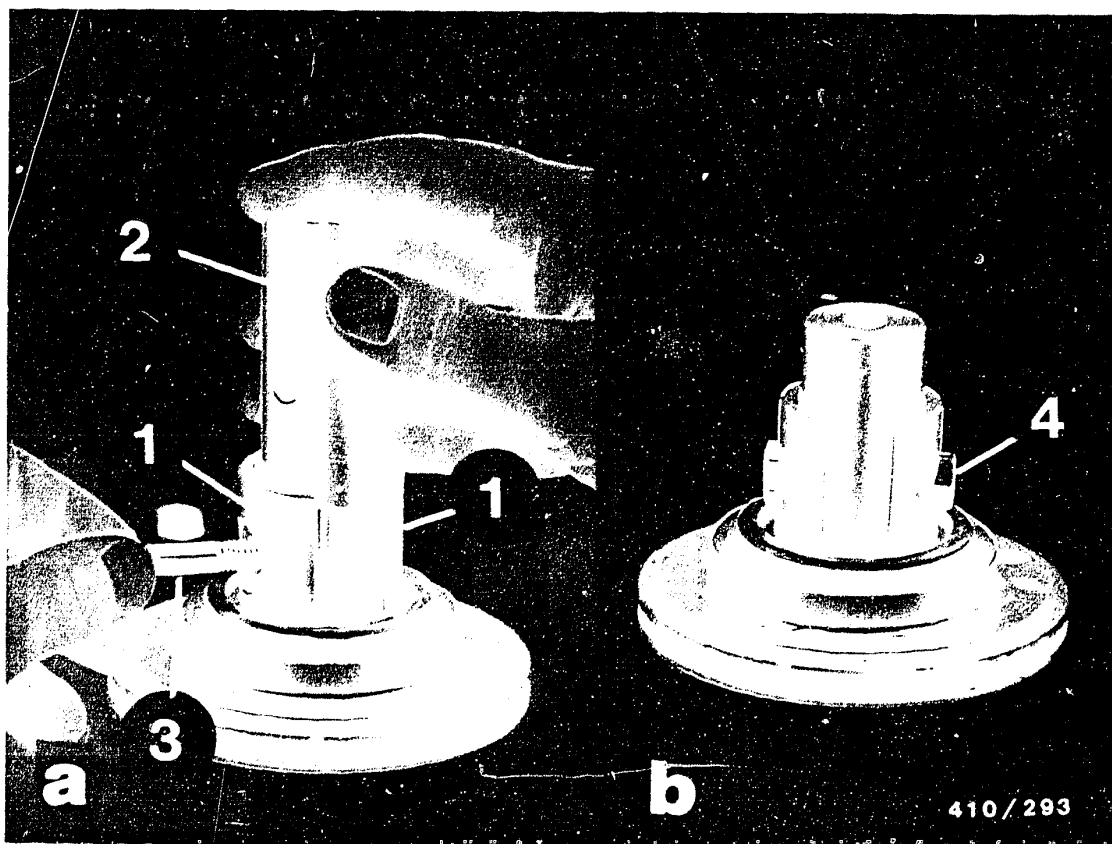
Lay complete bearing cover on the mounting plate of a press so that the neck of the bearing cover fits in.

Put press-out mandrel KDEP 1572 on the rollers of the roller bearing and press bearing out of bearing cover (picture b).

The bearing is thereby destroyed.

Re-use is therefore not allowable.

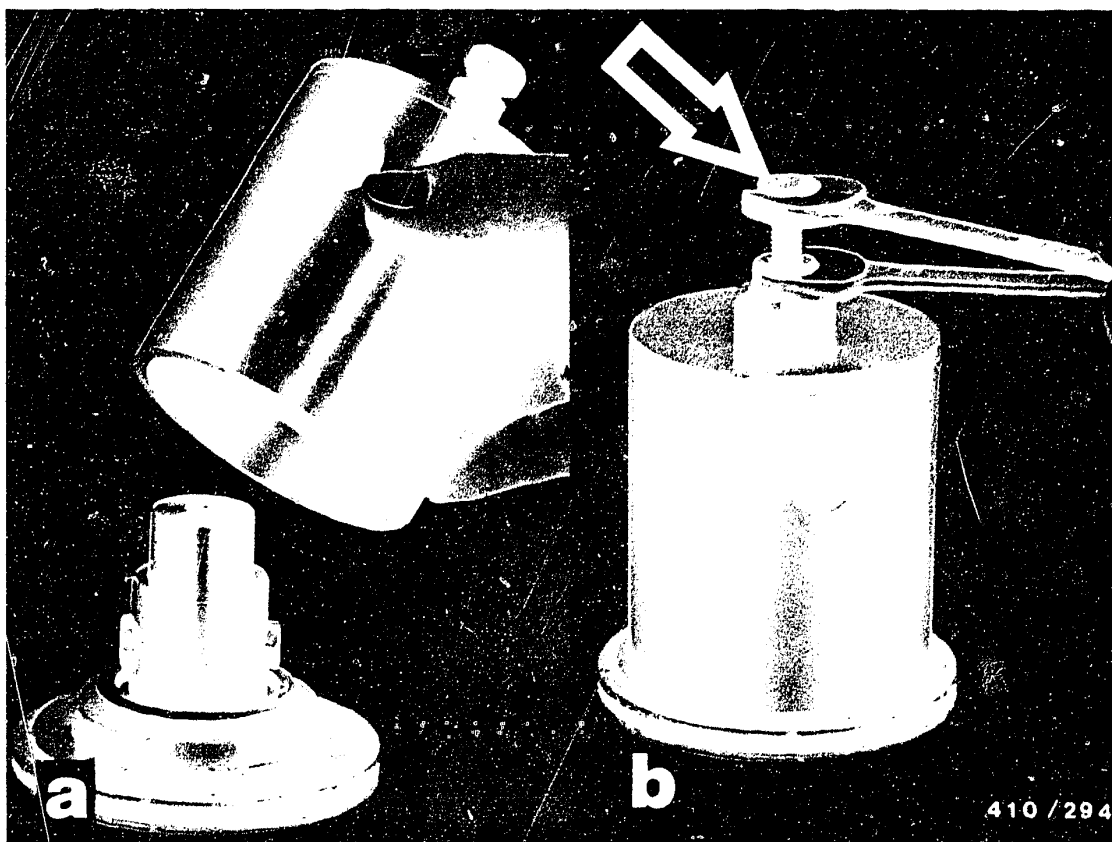




11.2 With bearing diameter 35 mm the cylindrical rollers of the drive-end bearing are removed and the two halves of puller KDEP 1570 are introduced into the bearing outer race.

Then the holding mandrel (2) is stuck between the puller parts, so that the connecting screw (3) can be pushed through all three parts (picture a).

Then the fastening nut (4) is screwed onto the connecting screw and is tightened by hand (picture b).



Slip puller bell KDEP 1569/1 over the mounted puller (picture a).

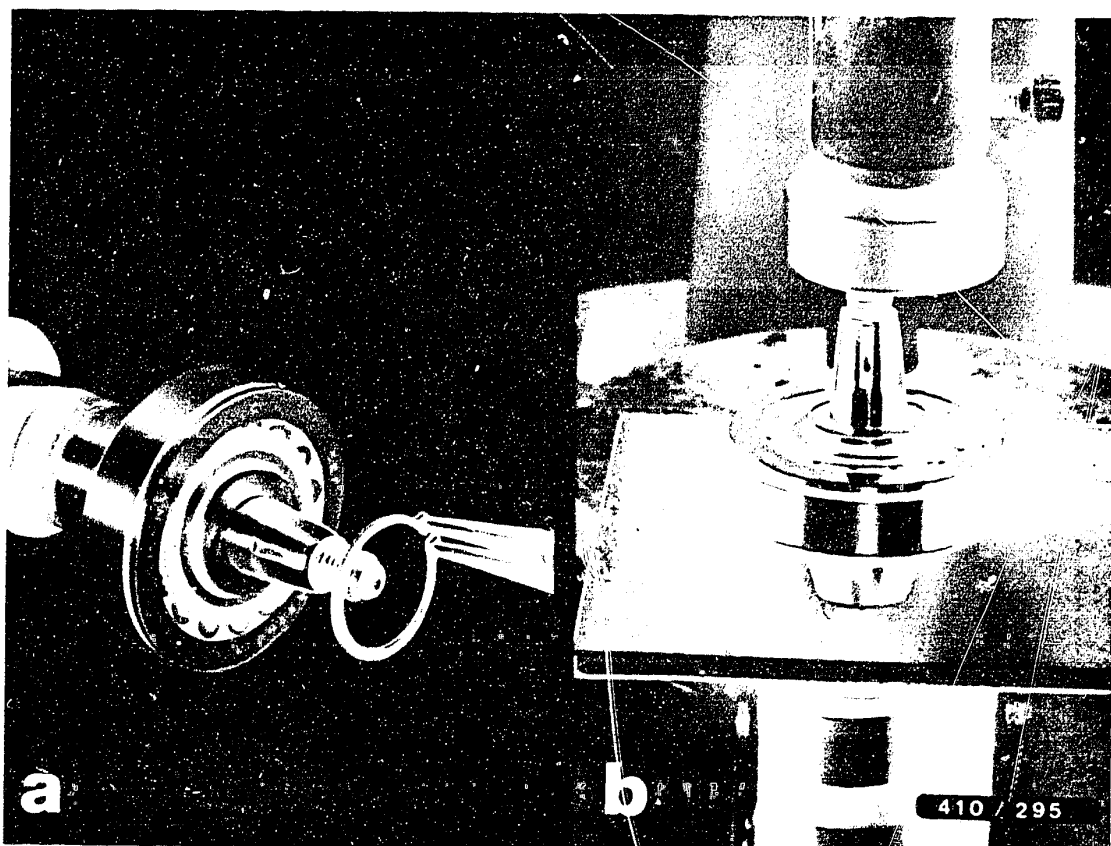
Screw forcing-off screw into the pin of the puller (arrow) and, by turning the nut with the open-end wrench, withdraw the bearing outer race from the bearing cover using puller KDEP 1570. Hold the screw while doing this (picture b).

The bearing outing race is thereby destroyed. The complete bearing must therefore be discarded and replaced by a new one.

**C18**

Replace camshaft bearing  
PE(S).. P.. S 7100, S 7800





Remove retainer from camshaft (picture a).

Using forcing-off plate KDEP 1580, force camshaft out of self-aligning roller bearing (picture b).

The bearing is thereby destroyed.  
Re-use is not allowable.

**C19**

Replace camshaft bearing

PE(S).. P.. S 7100, S 7800





The governor-end camshaft bearing is a self-aligning roller bearing.

For this reason, proceed with utmost care when subsequently mounting this bearing on the camshaft.

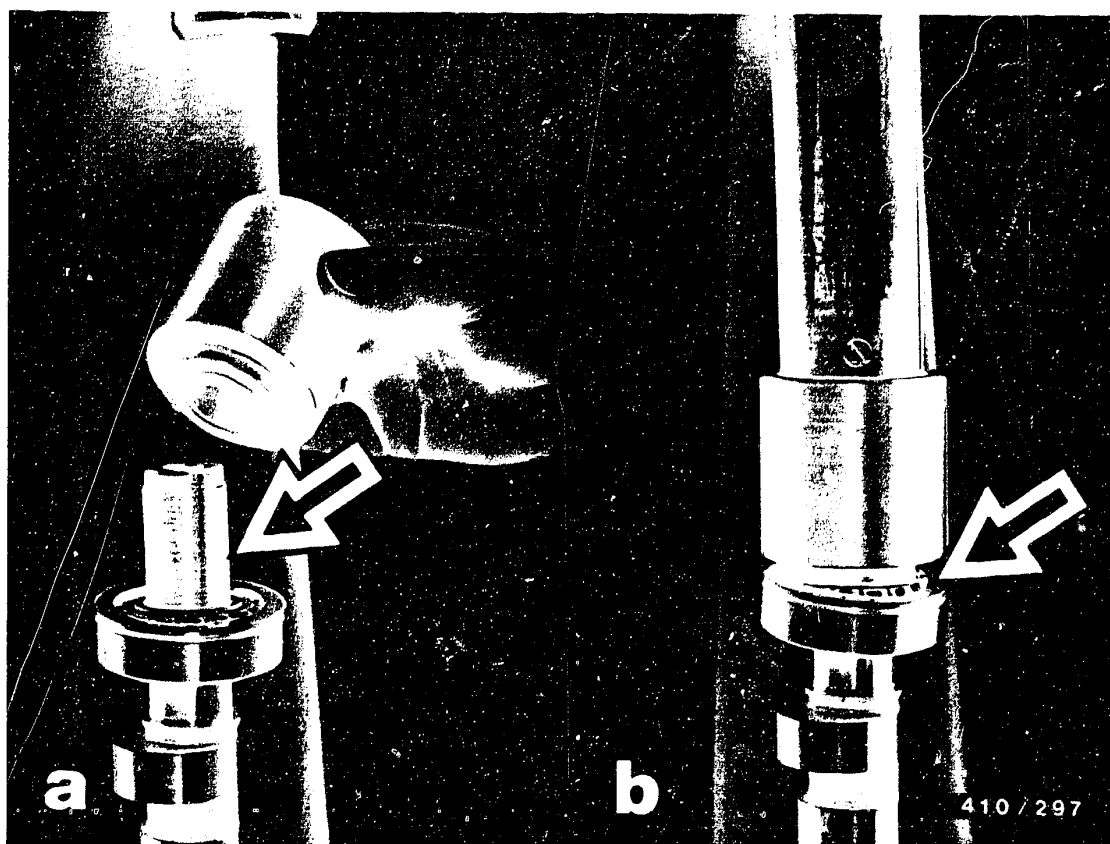
Place camshaft vertically and provisionally put complete self-aligning roller bearing on camshaft.

**C20**

Replace camshaft bearing

PE(S).. P.. S 7100, S 7800





Screw guide nut of press-in tool KDEP 1552 (picture a - arrow) onto thread of camshaft.

Carefully put sleeve of tool with the machined collar on the inner race of the self-aligning roller bearing (picture b - arrow) and press the bearing as far as it will go onto the bearing seat of the camshaft.

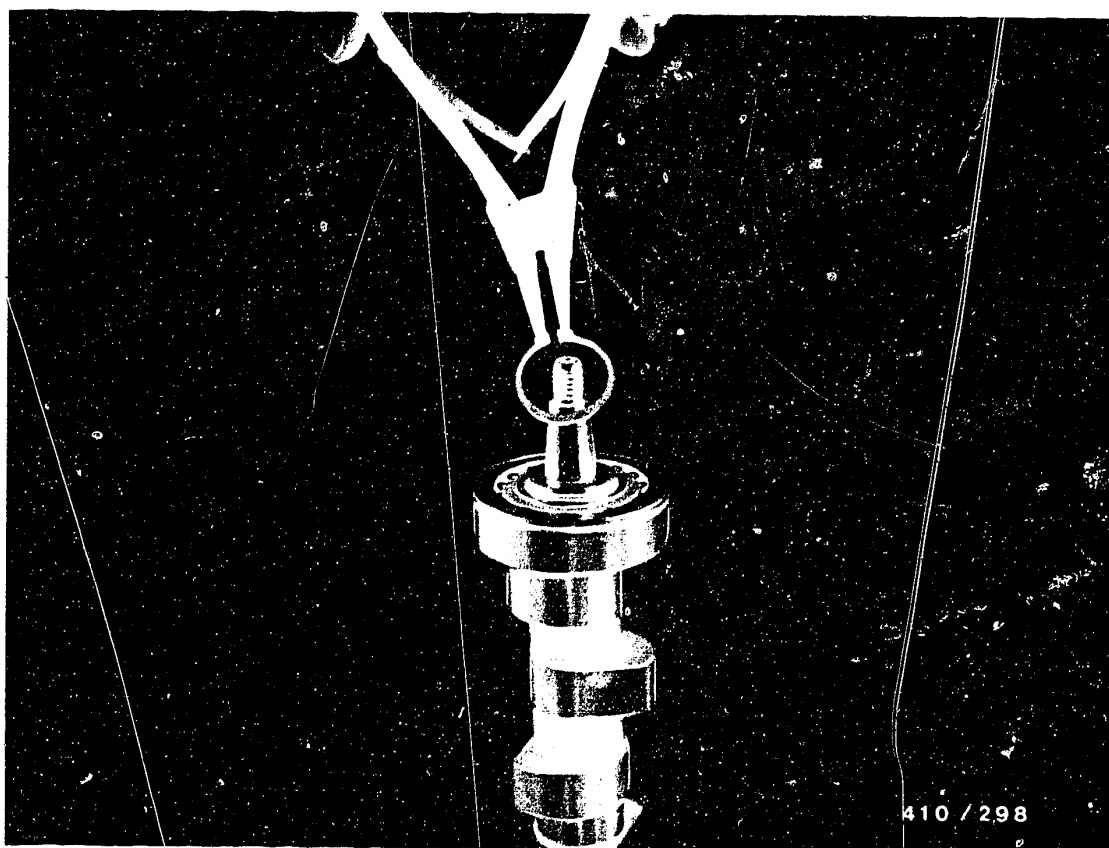
When mounting the bearing, make sure that the annular groove of the bearing outer race is on the outside.

**C21**

Replace camshaft bearing  
PE(S).. P.. S 7100, S 7800







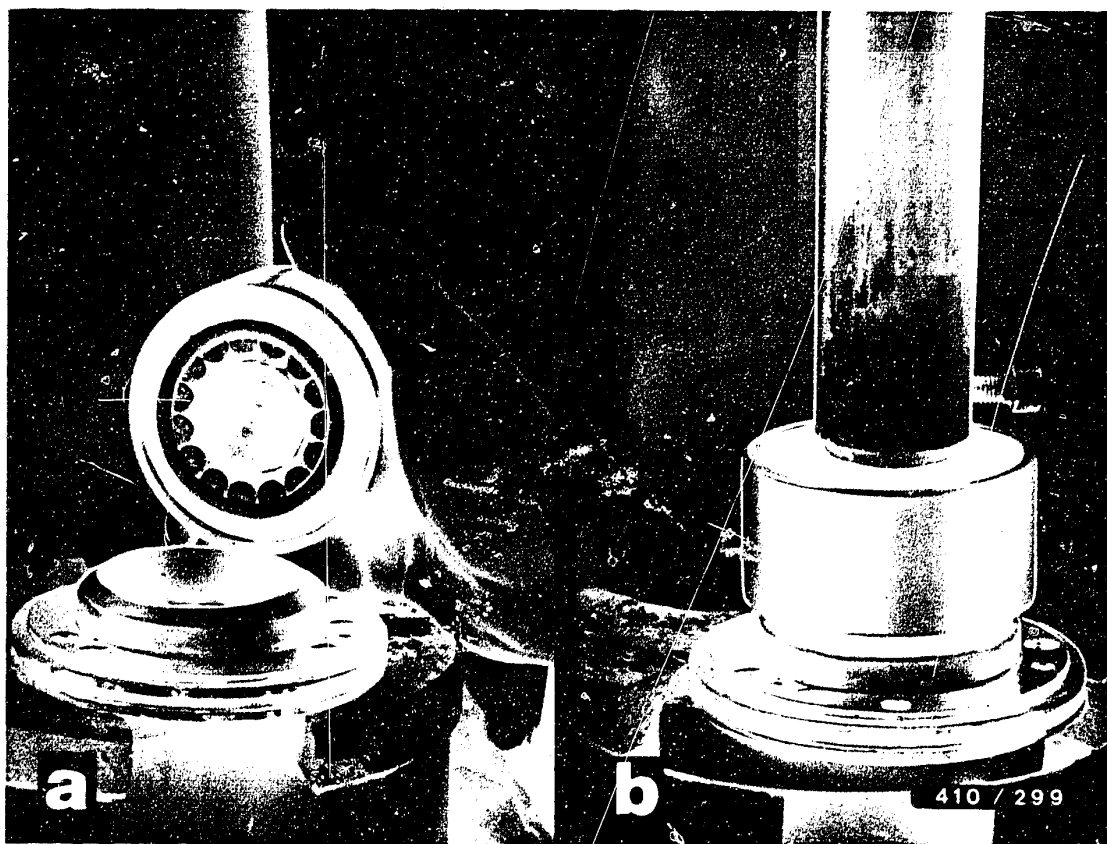
Mount shaft retainer.

**C22**

Replace camshaft bearing

PE(S).. P.. S 7100, S 7800





To install in the drive-end bearing cover, put cylindrical-roller bearing onto the mandrel of press-in tool KDEP 1551.

Make sure that the bearing is put onto the correct side of the press-in tool, depending on the inside diameter of the bearing (30 mm or 35 mm) (picture a).

Press cylindrical-roller bearing as far as it will go into the appropriate mounting hole of the bearing cover (picture b).

## 12. ASSEMBLE FUEL-INJECTION PUMP

Wet pump plungers with calibrating oil prior to assembly.

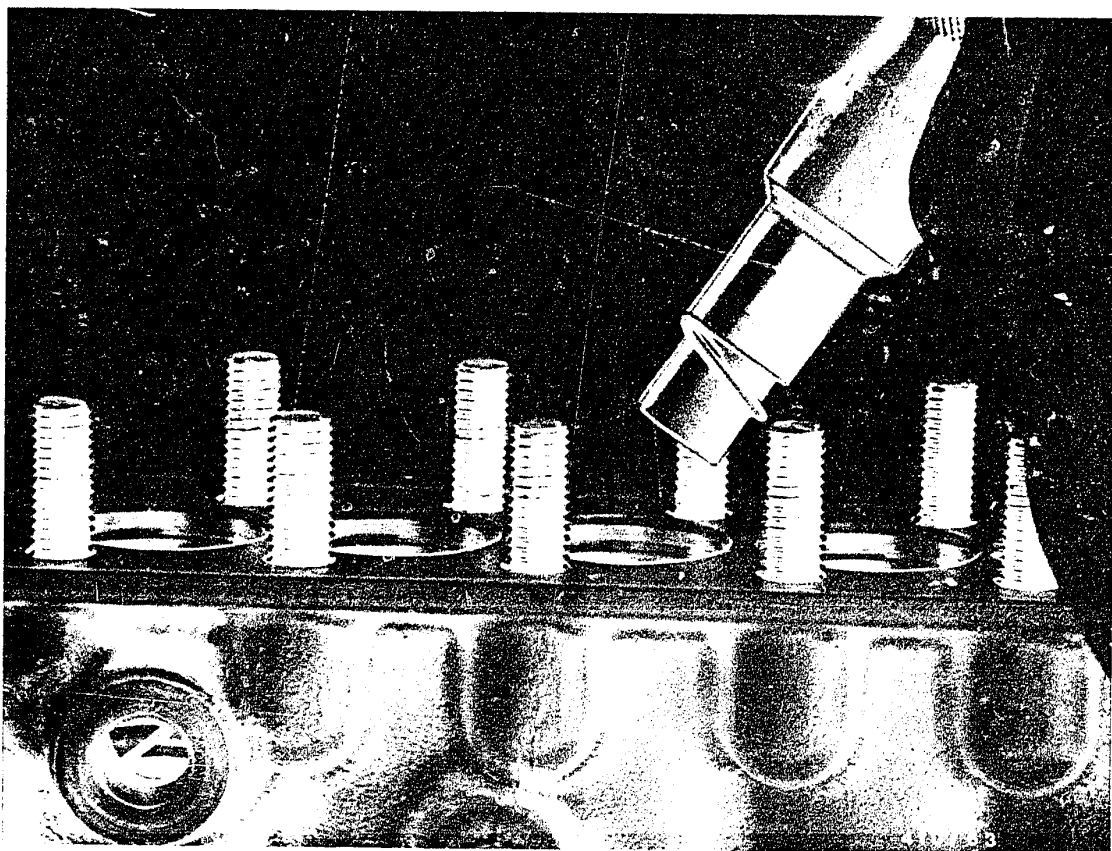
Rub O-rings with tallow.

**D1**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





## 12.1 Mounting

### Insert lower O-rings

Using insertion device KDEP 2884, insert the lower O-ring (as per service-parts list) of the flange-type plunger-and-barrel assembly. Rub tallow into O-ring. Depress the ram of the device and slip the O-ring onto the projection sleeve (see picture). Insert device and release ram.

### Note:

Do not mount O-ring together with barrel-and-valve assembly by pushing onto flange element. This will damage O-ring.



Insert flange element so that its notch points toward control rod (back of pump).

Do not use force to press in barrel-and-valve assembly.

Screw on hexagon nuts, but do not tighten.

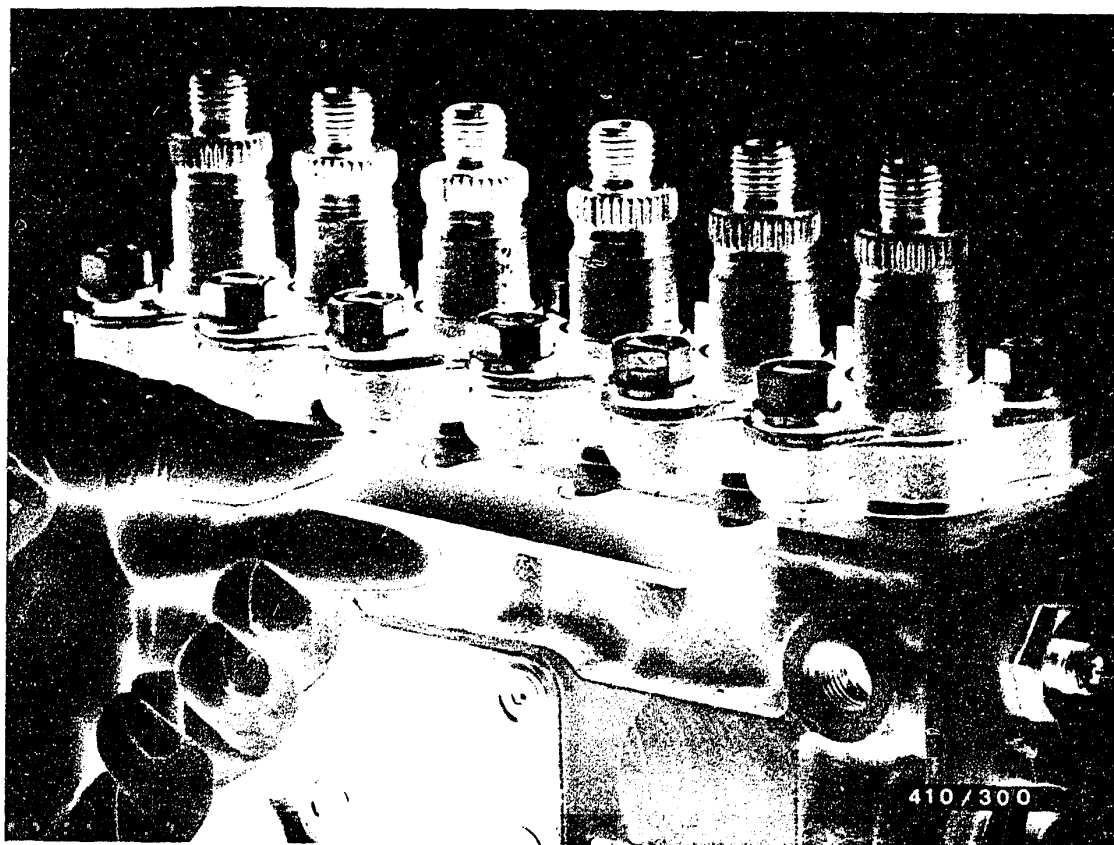
Turn barrel-and-valve assemblies so that stay bolts are in the center of the slots.

**D3**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





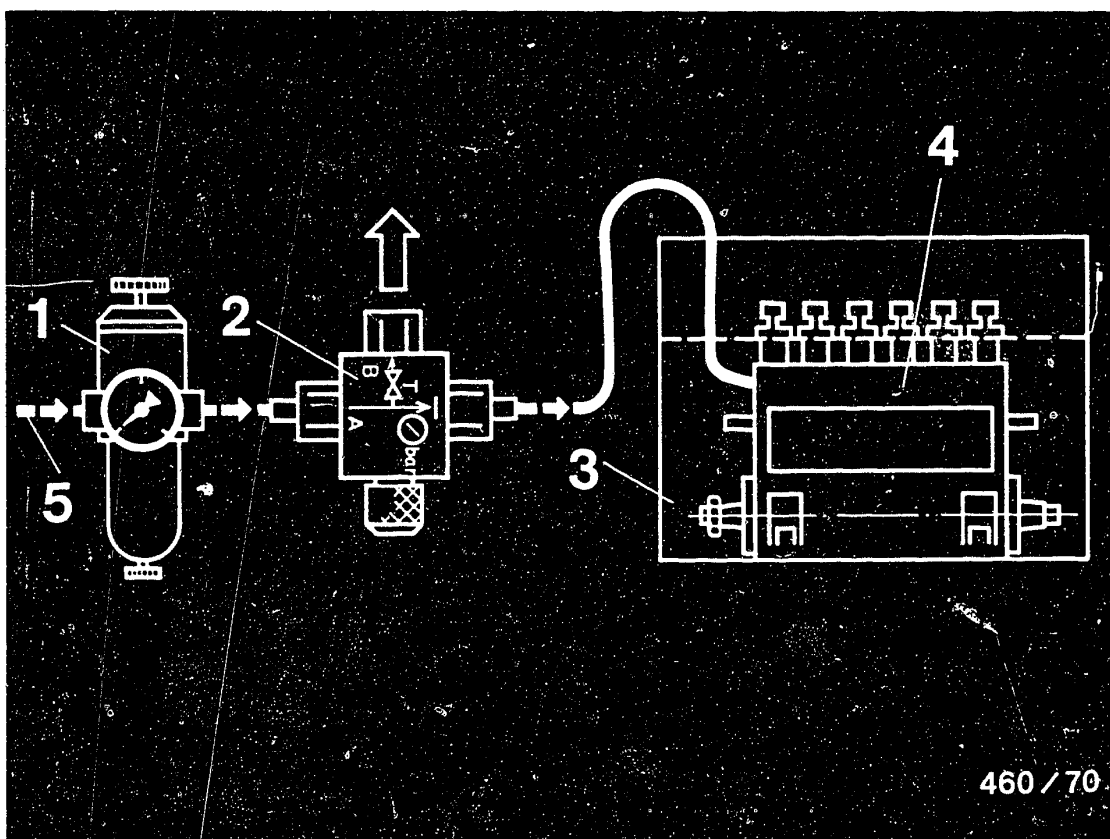
Raise flange elements so that the spacer plates KDEP 1550 can be put under the flanges.

Tighten fastening nut by hand so that the spacer plates cannot drop out from under the element flanges.

**D4**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





460 / 70

- 1 = Pressure regulator with pressure gauge 0...6 bar and water trap
- 2 = Directional-control valve KDJE-P 100/1
- 3 = Immersion tank with calibrating oil
- 4 = Injection pump
- 5 = Compressed air

## 12.2 Leak test on suction gallery

Tilt pump. Wet pump plungers with calibrating oil and introduce into barrel-and-valve assemblies. Ensure freedom of movement.

Insert holding pins KDEP 1571 into locating bores.

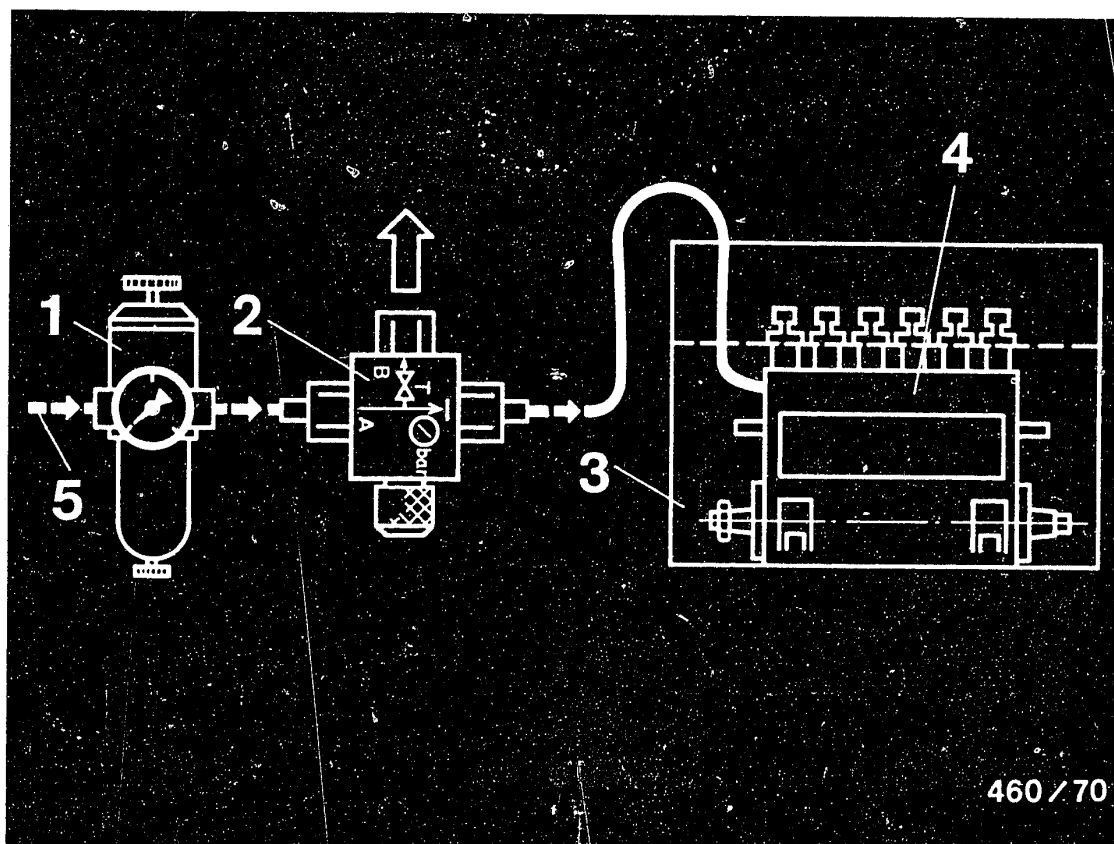
Remove Robo diaphragm, if applicable. Unscrew pump from clamping support. Connect pump to existing compressed-air supply system by way of a pressure regulator with water trap.

**D5**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





- 1 = Pressure regulator with pressure gauge 0...6 bar and water trap
- 2 = Directional-control valve KDJE-P 100/1
- 3 = Immersion tank with calibrating oil
- 4 = Injection pump
- 5 = Compressed air

To obtain the specified pressure reduction during the leak test, insert the directional-control valve KDJE-P-100/1 of pressure tester KDJE-P 100 into the compressed-air inlet (see picture).

For testing, immerse the pump vertically into the test bath. The openings of the delivery-valve holders must not be below the level of the calibrating oil.

**D6**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





Pivot the pump only in order to locate any existing leaks.

Test time and test pressure

8 minutes at 5 bar and then

1 minute pulsating 0 to 5 bar

Leaks in the region of the suction gallery are not allowable. Pay particular attention to leaks at the plunger-and-barrel assembly seats and O-ring seals.

This does not apply to leaks between barrel and plunger.

Take pump out of test bath and mount on clamping support.

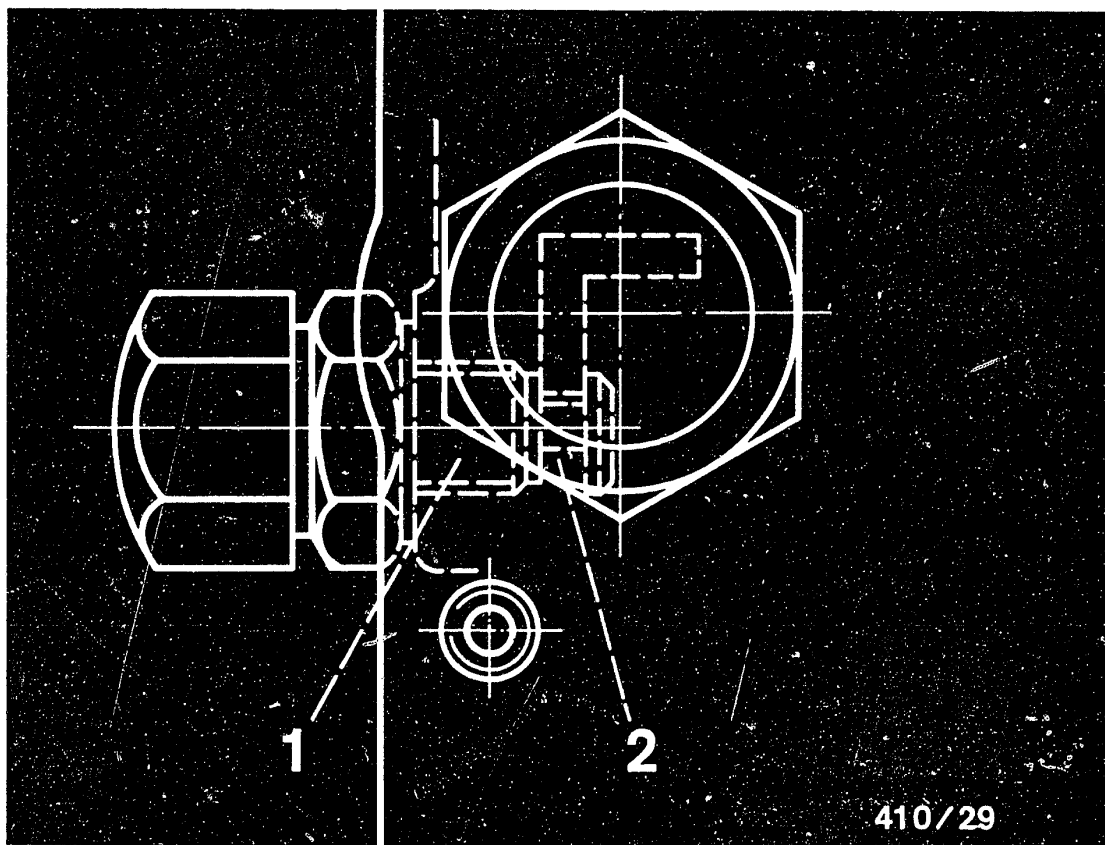
Remove holding pins.

Pull pump plunger out of barrel-and-valve assembly.

Note:

To prevent any skin irritation, grease your hands before testing with protective skin cream and wash with soap and water after testing is completed.

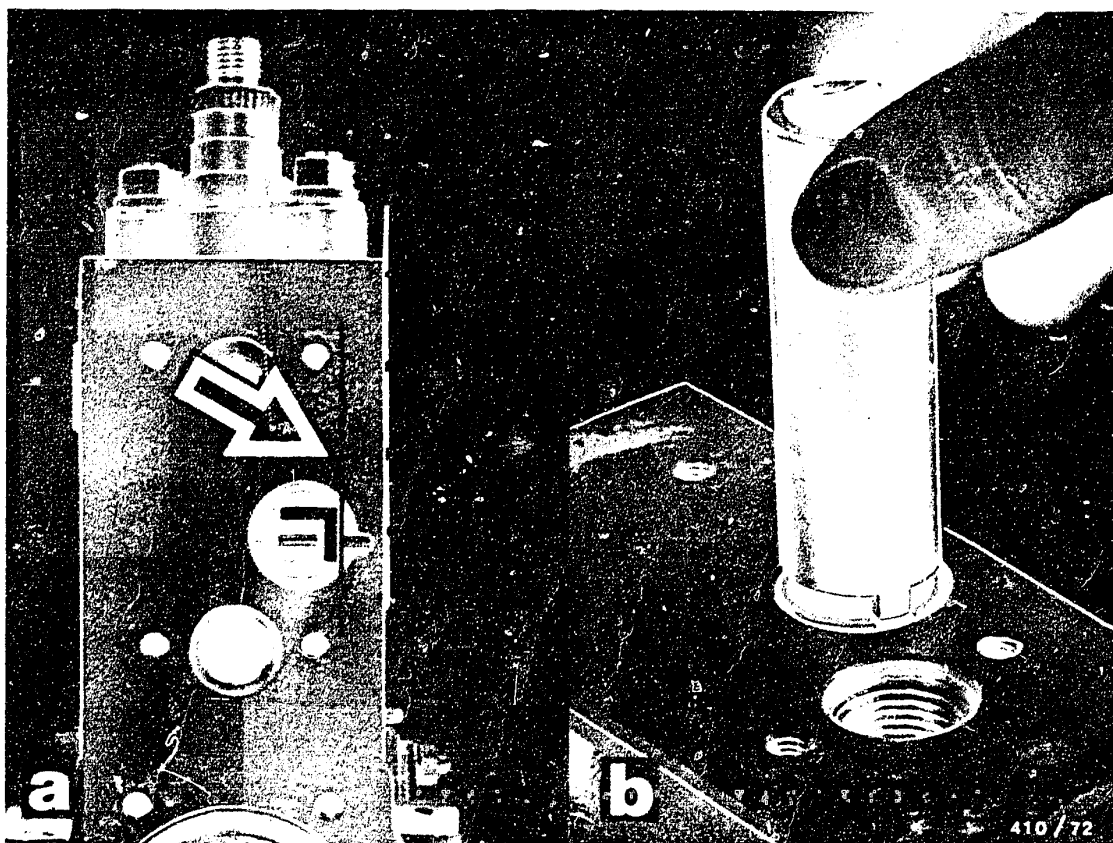




- 1 = Control rod guide screw
- 2 = Control rod guide

#### Inserting the control rod guide screw

Some 10 and 12 cylinder injection pumps have a control rod guide screw screwed into the center of the pump. Before introducing the control rod, screw the guide screw into the pump housing.



### Installing the guide bushings and control rod

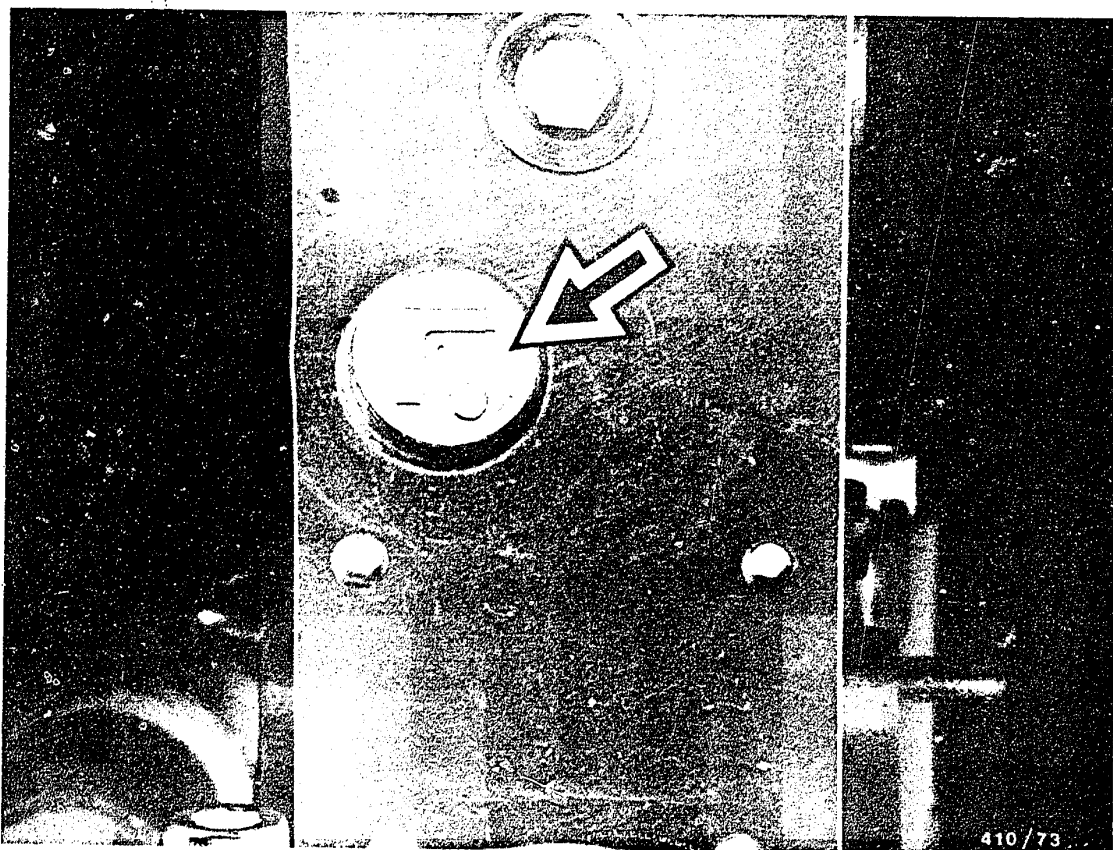
At the governor end, press in a new guide bushing (if necessary) with a suitable sleeve so that the vertical guide groove in the guide bushing is parallel to the pump housing (see picture a). Introduce the control rod. Insert straight pin into guide bushing. Screw in threaded ring with socket pin wrench KDEP 1577 and tighten to 30...40 Nm (see picture b).

**D9**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





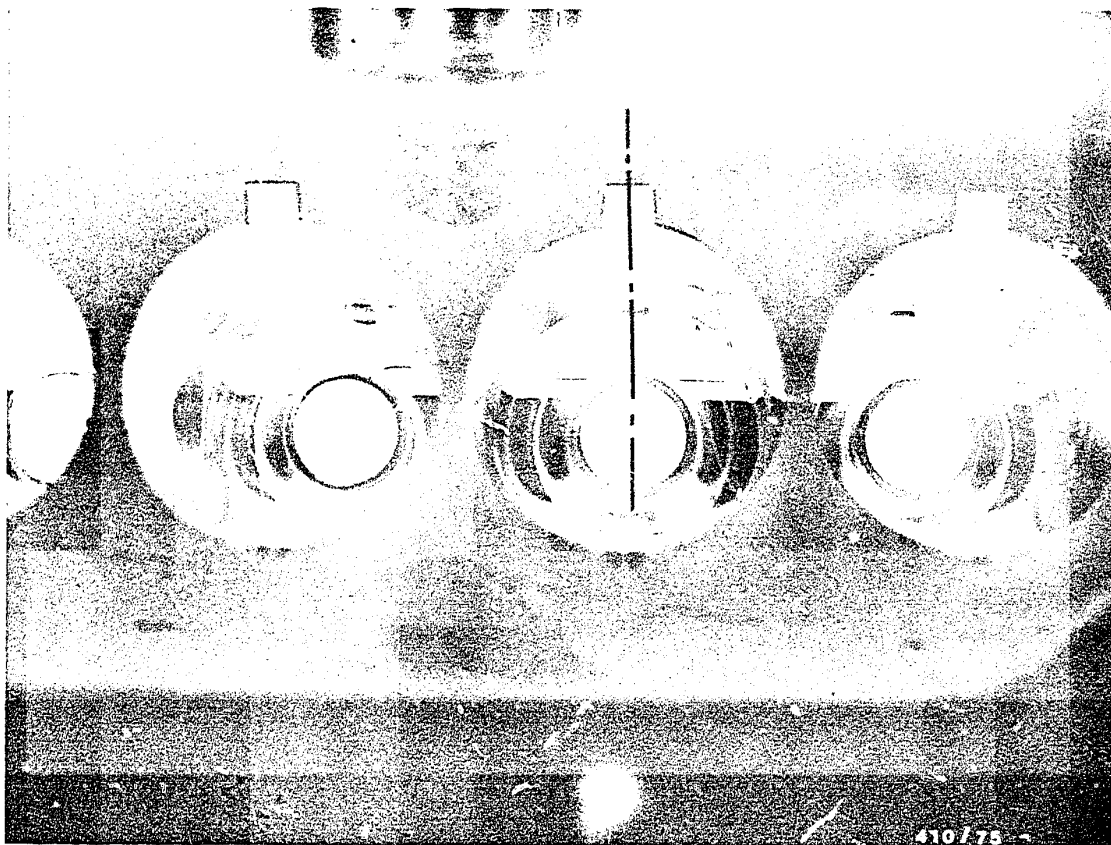
At the drive end, insert guide bushing (see picture, arrow) over control rod into housing (guide bushing does not have a tight fit). Screw in screw plug with seal ring and tighten to 30...40 Nm.  
Check whether control rod moves freely.  
If applicable, adjust control rod guide screw so that control rod still moves freely. Tighten guide screw lock nut.

**D10**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





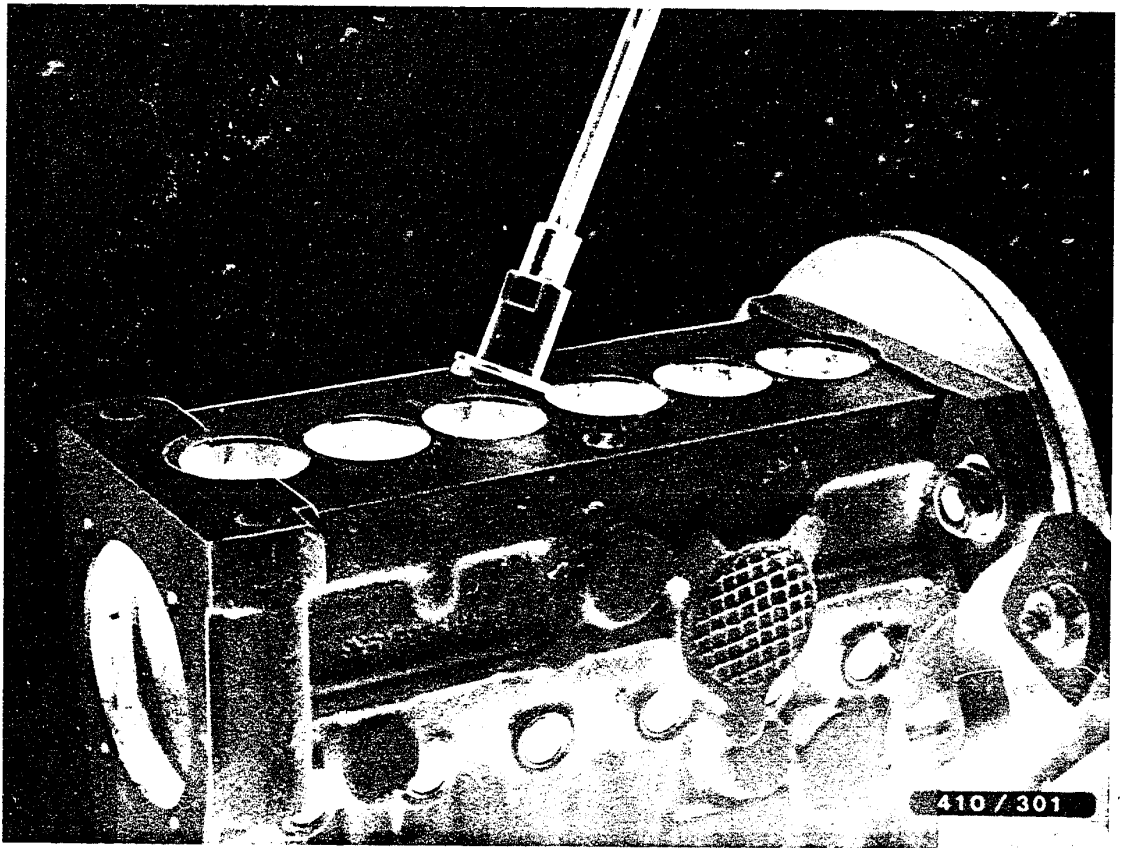
### Inserting the control sleeves

Bring control rod into center position.  
Driver slots in control rod for the control sleeves  
align with the roller-tappet guides in the pump housing.

**D11**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





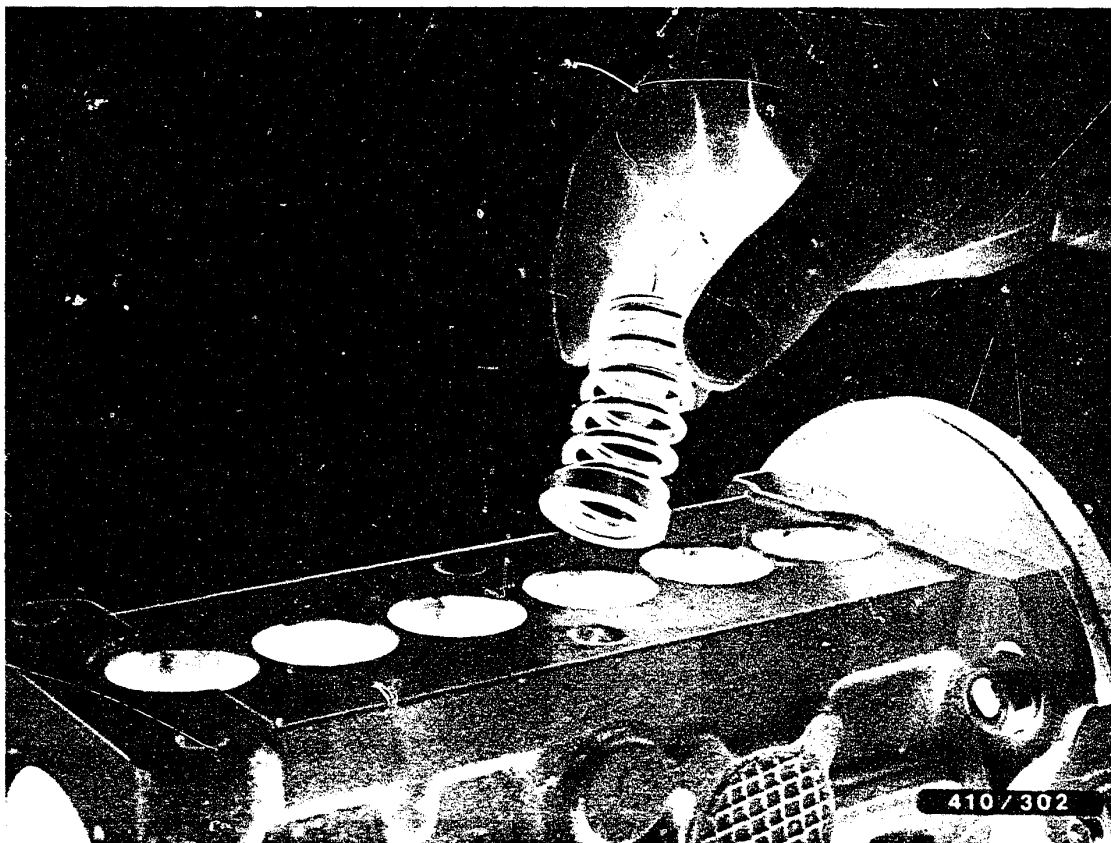
Insert control sleeve with assembly tool KDEP 1071 so that the driver balls of the control sleeves come into engagement with the driver slits of the control rod.

Constantly check control rod for freedom of movement when doing this.

**D12**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Using grease, stick compression spring into upper spring seat and then introduce into pump housing.

**D13**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800





Slide lower spring seat onto the base of the pump plunger.

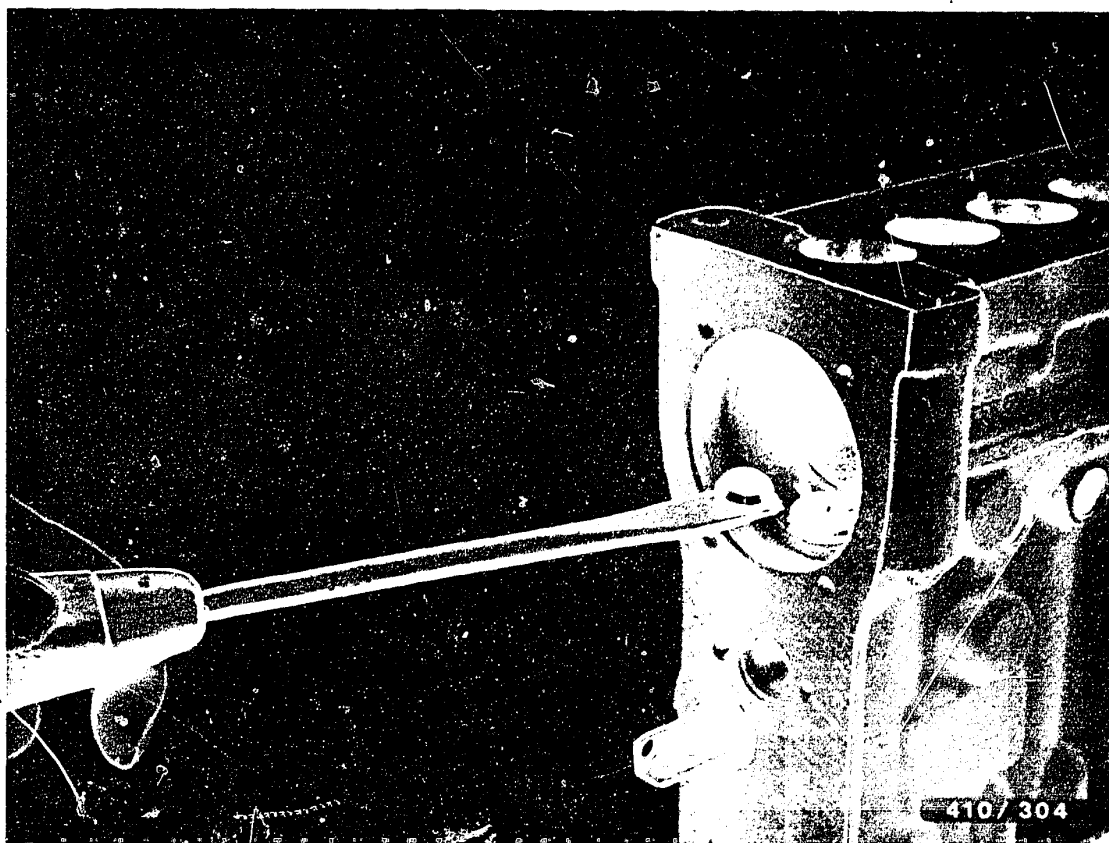
Using plunger pliers KDEP 1575, introduce pump plunger and spring seat into pump barrel so that the mark on the plunger control arm points toward the back of the pump (control rod).

**D14**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





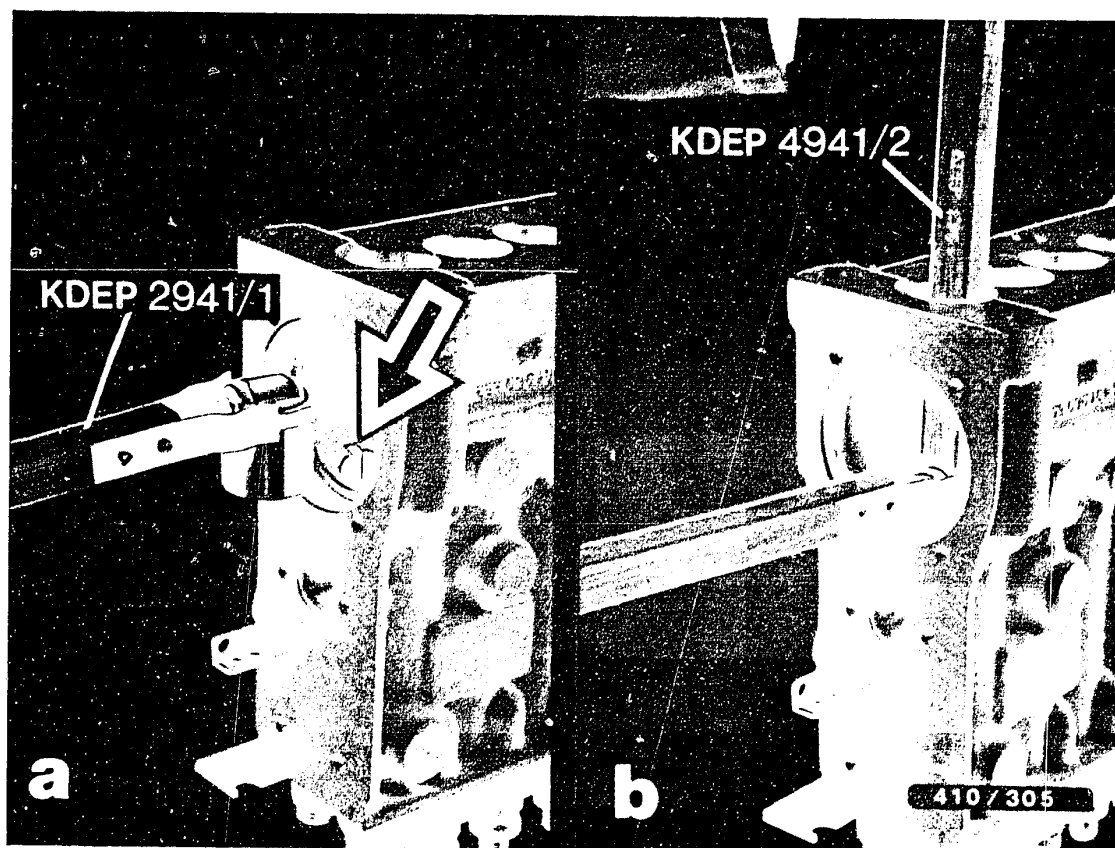


Using a suitable tool, insert pressure plates into the recesses of the spring seats.

**D15**

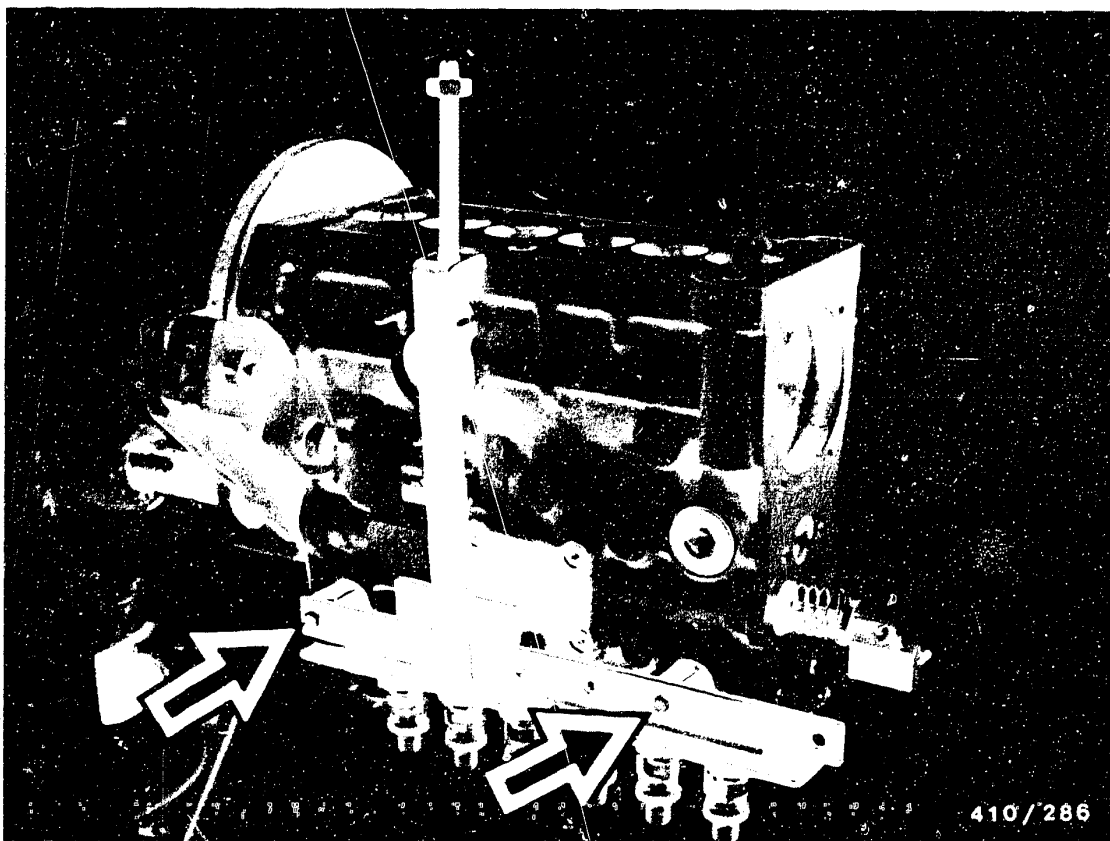
Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Clamp roller tappet in tappet forceps KDEP 2941/1 and introduce through the bearing-cover opening into the camshaft chamber so that the slider for guiding the roller tappet aligns in its position with the guide groove of the roller-tappet bore in the pump housing (picture a - arrow).

Using assembly tool KDEP 2941/2, introduce roller tappet into tappet bore in pump housing (picture b).

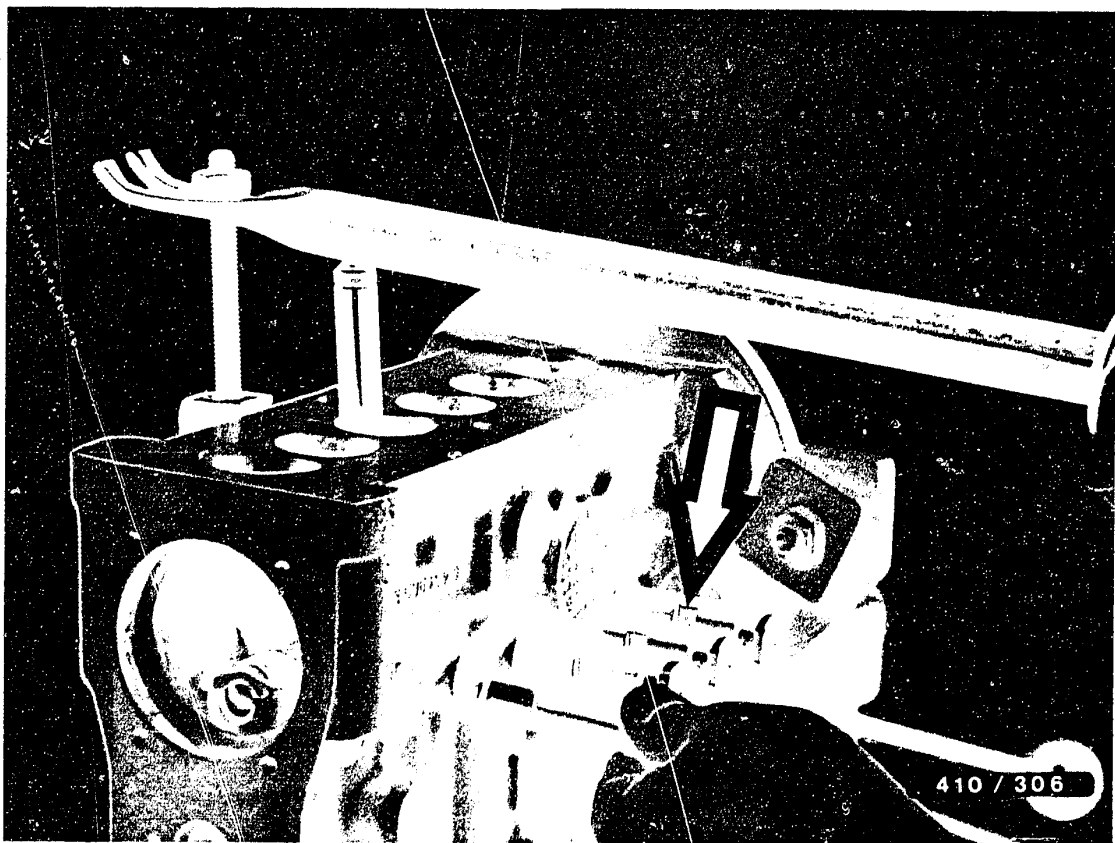


Mount mounting device KDEP 1556 on the pump housing. To do this, screw the fastening screws (arrows) into the threaded holes of the fuel inlet and return and tighten.

**D17**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Stick pipe lever of mounting device KDEP 1505 onto the holding pin of mounting device KDEP 1556.

Place thrust pin on the roller of the first roller tappet and carefully press roller tappet into the tappet bore in the housing until tappet holder KDEP 1553 can be introduced until it comes up against the housing.

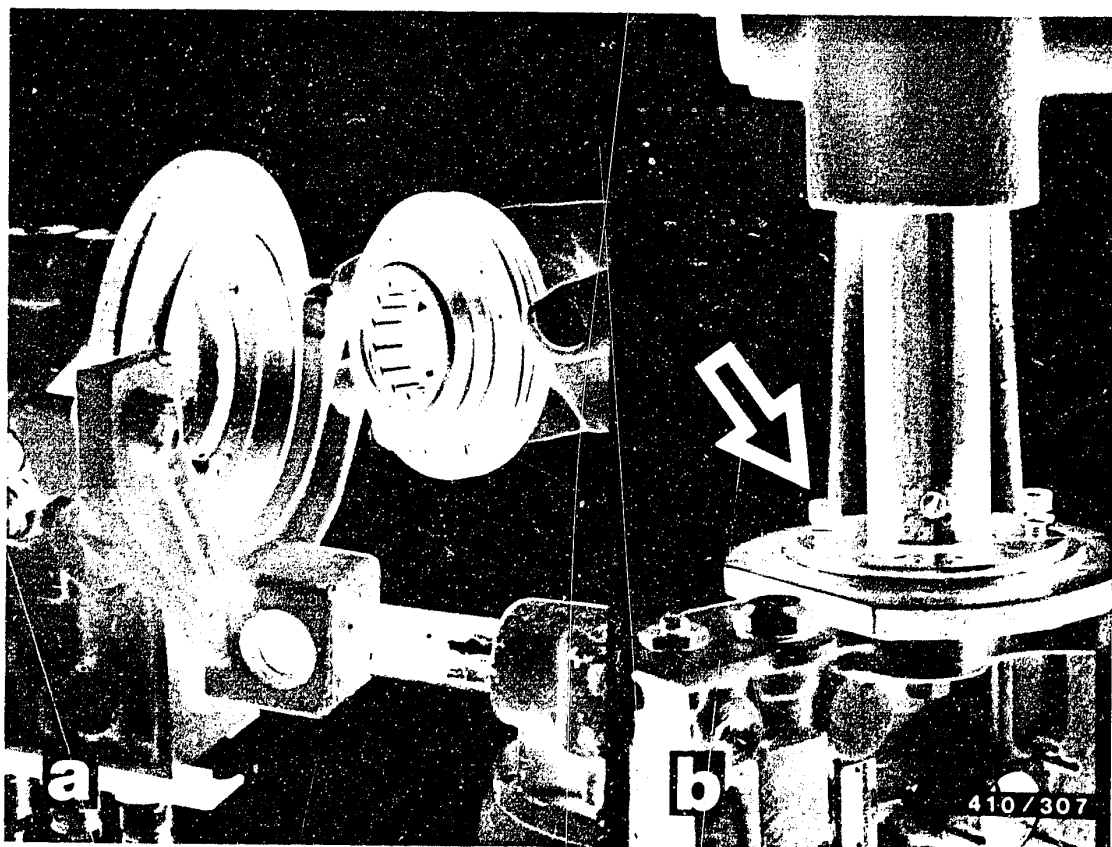
The laterally milled faces (arrow) must under all circumstances be vertical.

Note:

If the roller tappet cannot be introduced deep enough, then, with the pipe lever relaxed, move the control rod until the roller tappet can be pressed fully into its guide bore.

Remove mounting device KDEP 1556.



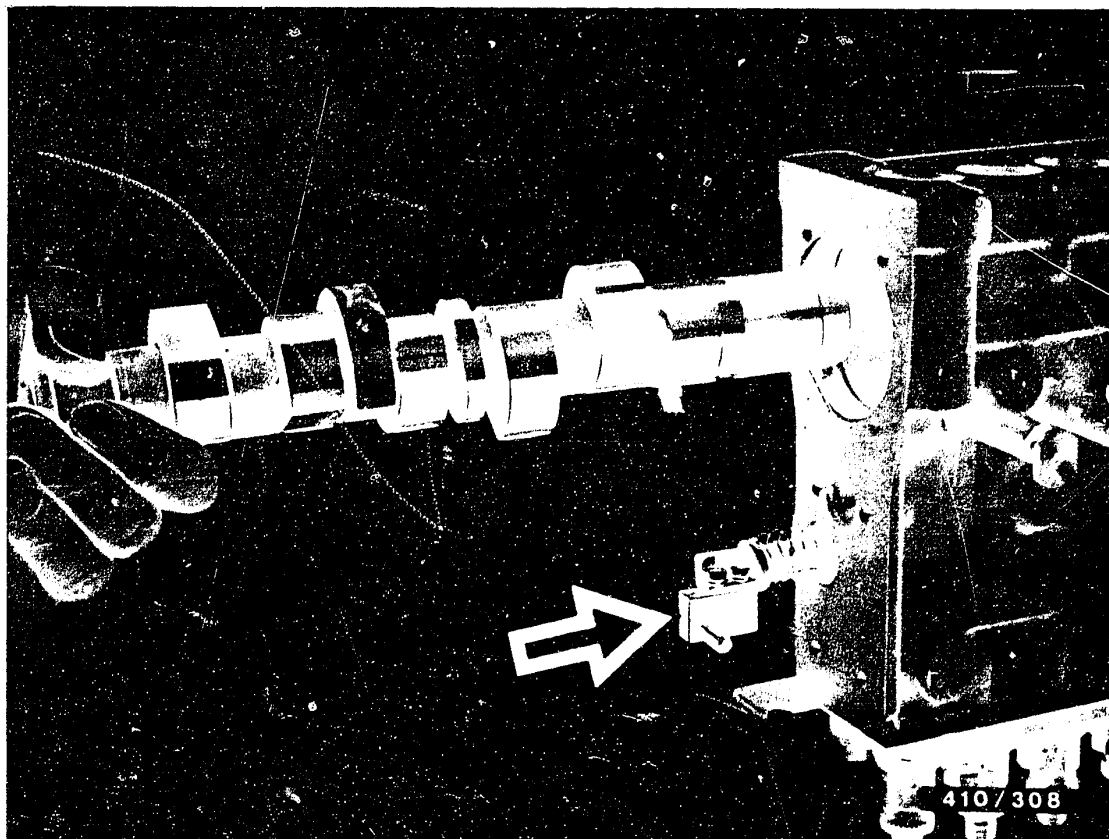


Introduce drive-end bearing cover by hand into the bearing-cover bore of the pump housing (picture a). When doing this, make sure that the positions of the fastening holes align with the corresponding threaded holes in the pump housing.

So that the positions are maintained when subsequently pressing in the bearing cover, provisionally screw in 2 fillister-head screws (picture b - arrow).

Screw in all bearing-cover fastening screws and tighten to the specified tightening torque 18 ... 20 Nm. When assembling, use new, micro-encapsulated screws.





Mount play-compensating spring of control rod and connecting strap (arrow).

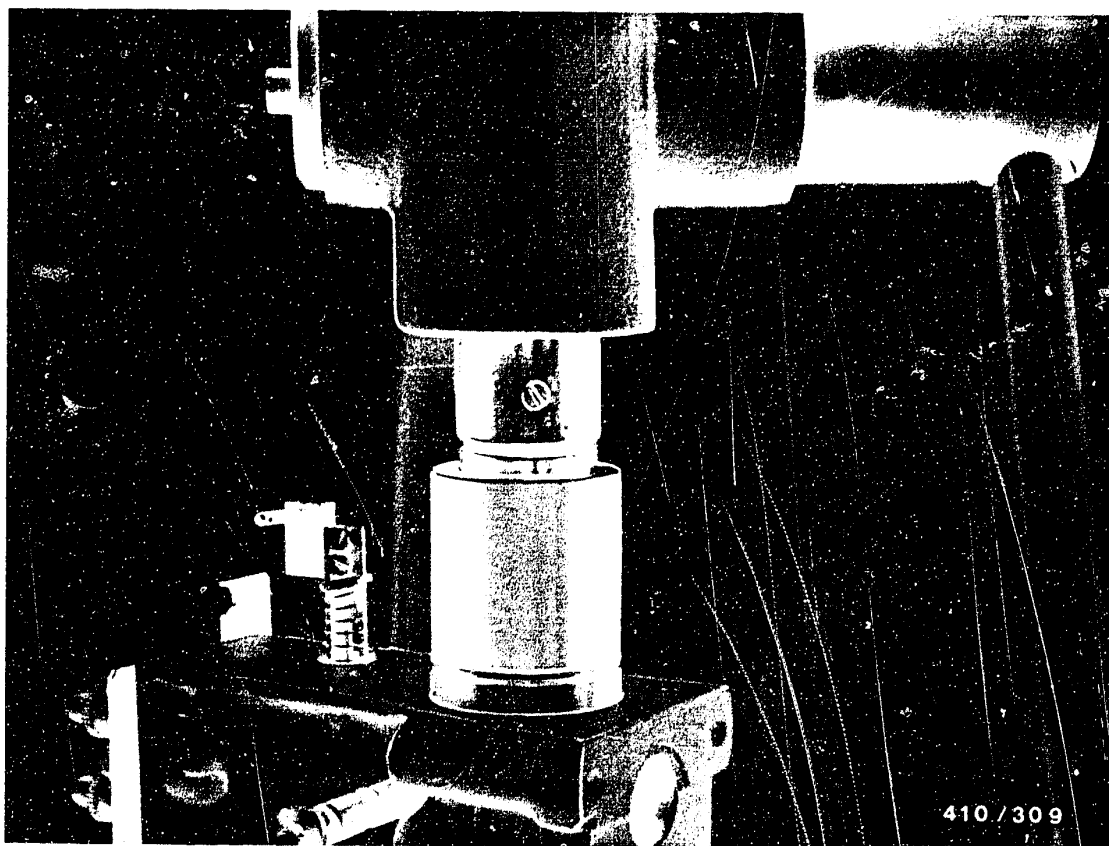
Screw mounting sleeve KDEP 1548 or KDEP 1549 onto drive-end thread of camshaft.

Introduce camshaft with intermediate bearing from governor end.

**D20**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Screw guide bushing of press-in tool KDEP 1552 onto the governor-end thread of the camshaft.

Slide press-in sleeve onto the guide sleeve so that its large diameter comes to lie on the outer race of the self-aligning roller bearing.

Caution:

Do not press on guide nut, if projecting, with the press.

Press bearing and camshaft into the pump housing.

In the case of pumps with end flange and mounted assembly plate, it is advisable to use support ring KDEP 1568 for supporting the pump.

**D21**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800



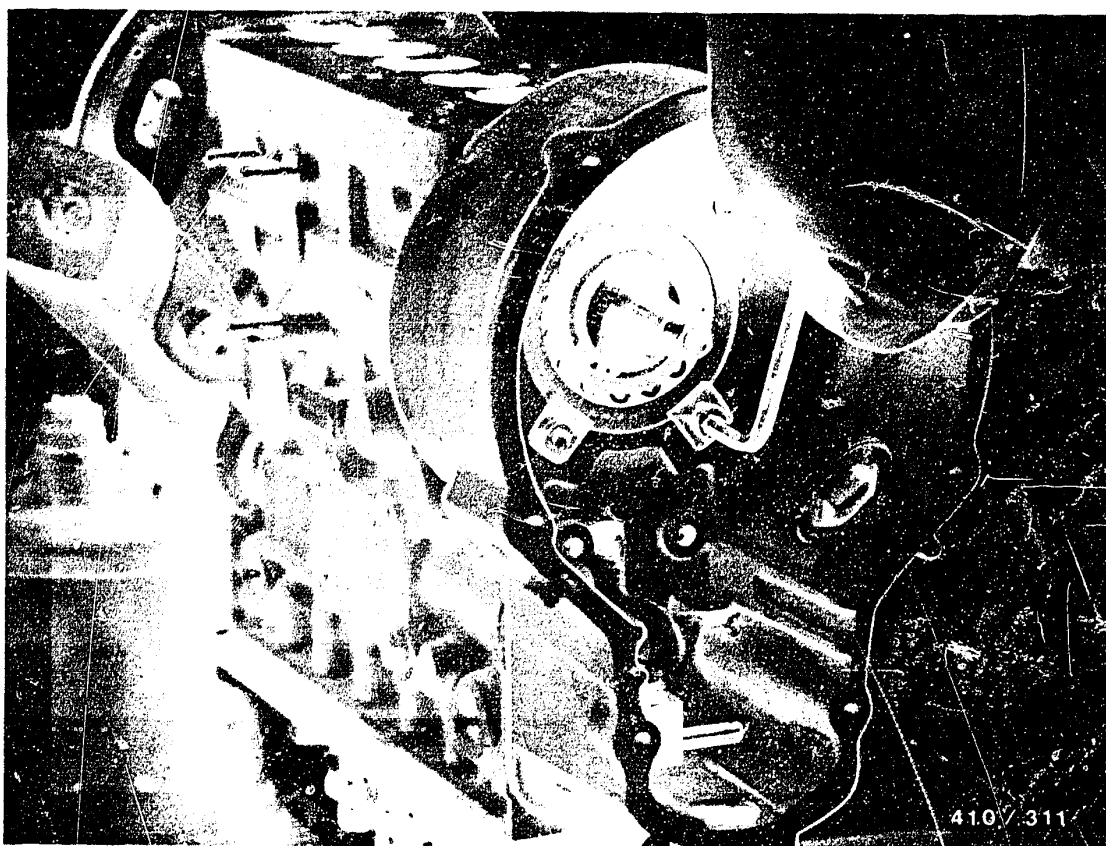


Using press-in mandrel KDEP 1554, knock base end covers into the mounting holes on the housing base (picture a).

Screw in micro-encapsulated fastening screws for intermediate bearing and tighten to 8 ... 10 Nm (picture b).

Use new screws only.  
Old screws must be discarded.





Insert gasket into governor housing.

Screw governor housing onto pump housing.

Do not forget mounting brackets (arrow).

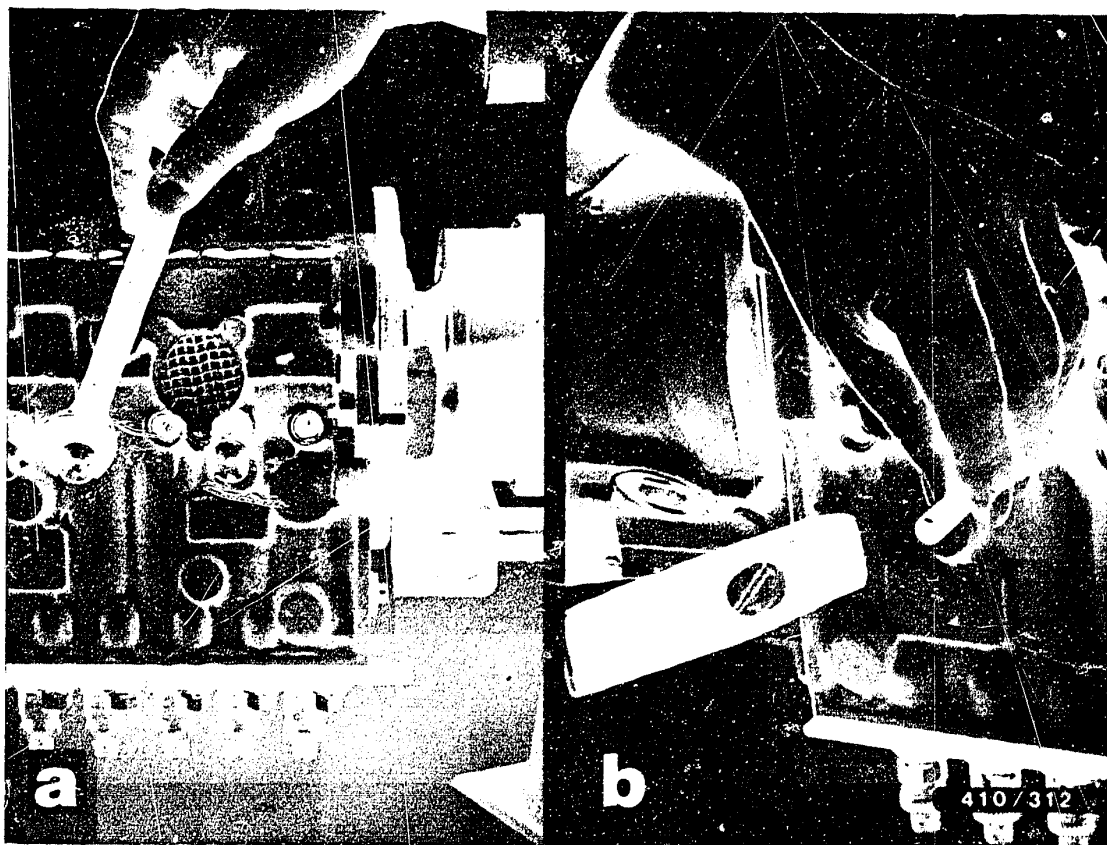
When assembling, use new, micro-encapsulated screws.

**D23**

Assemble fuel-injection pump

PE(S).. P.. S 7100, S 7800



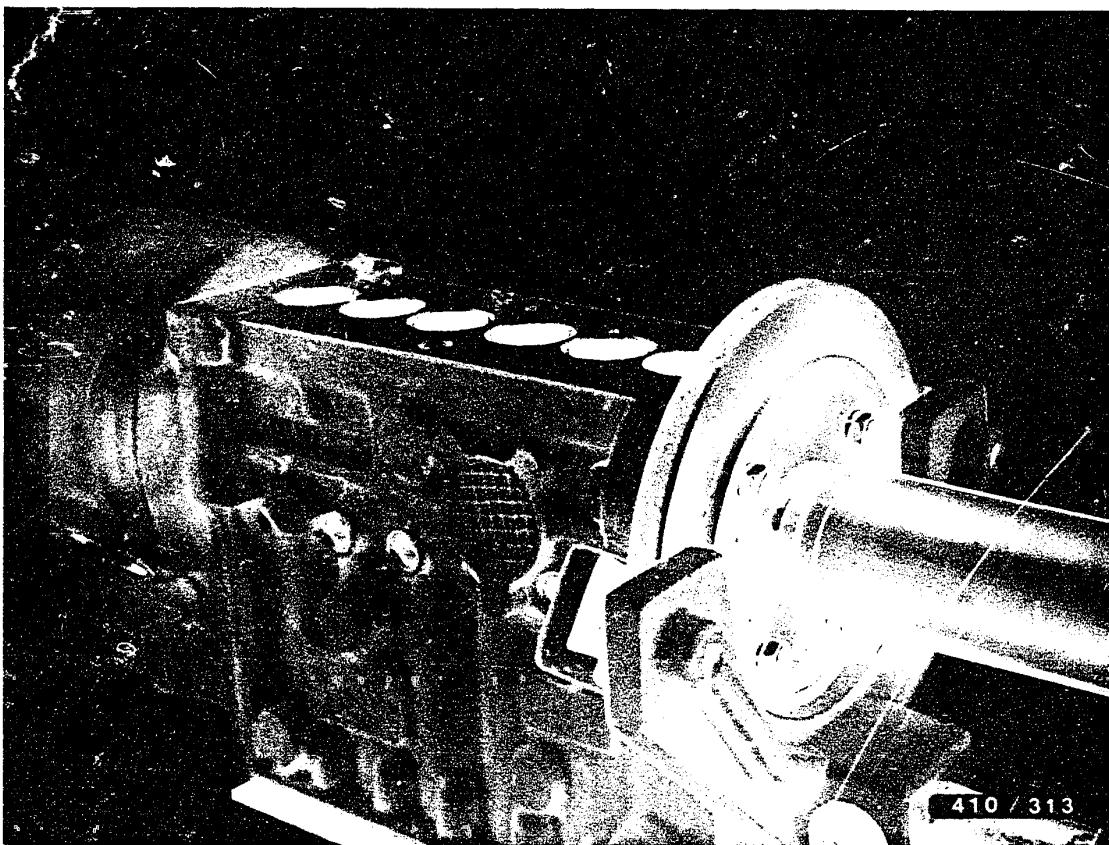


Mount driving coupling on drive-end cone of camshaft. If necessary, mount puller KDEP 1557 on the coupling flange.

Using holding wrench KDEP 1555, turn over camshaft and gradually turn the eccentric pins of tappet holders KDEP 1553 through 180°, thereby lowering the roller tappets onto the cams of the camshaft. Remove tappet holders (picture a).

Using press-in mandrel KDEP 1058, seal mounting bores for tappet holders with new sheet-metal enclosures (picture b).





Slide drive-end radial-lip-type oil seal, grease-free, over mounting sleeve KDEP 1548 or KDEP 1549 and camshaft.

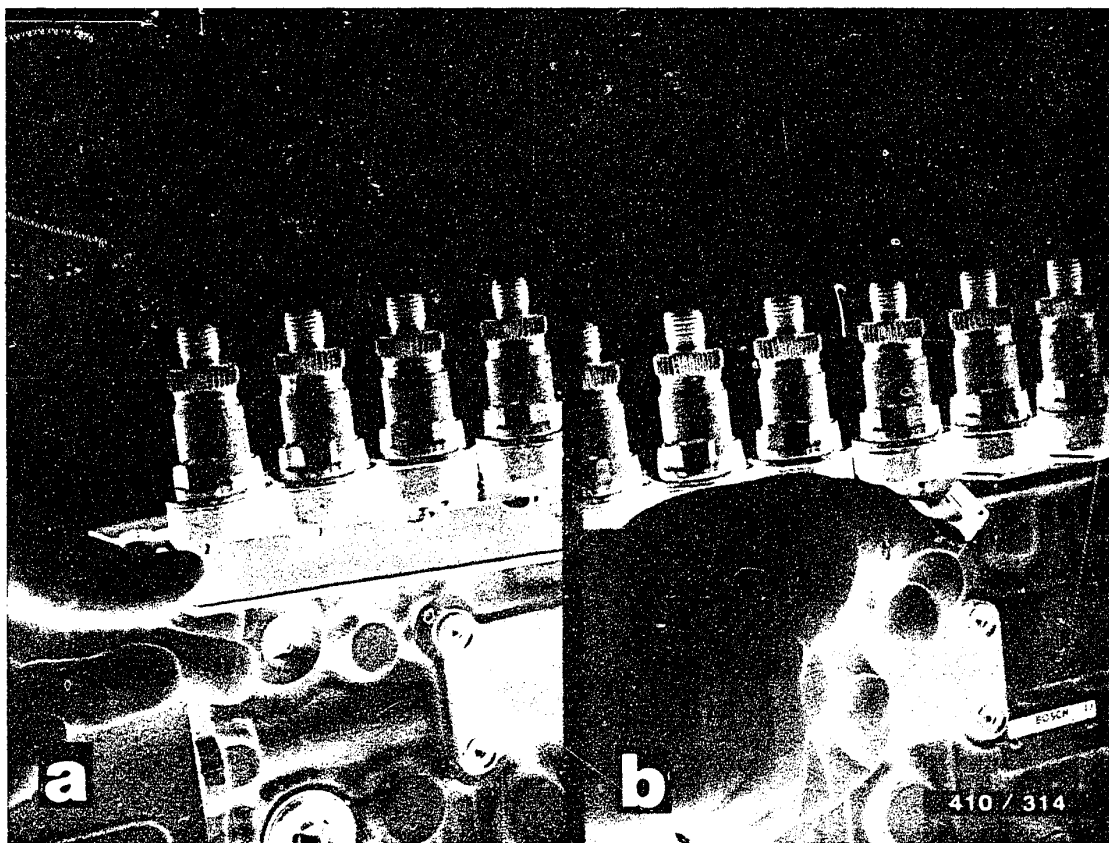
Using press-on tool KDEP 1558 or KDEP 1559, depending on cone diameter of camshaft, press the radial-lip-type oil seal into the recess provided in the bearing cover.

To facilitate installation, coat outer ring of radial-lip-type oil seal with tallow.

**E1**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800





Loosen fastening nuts of flange elements.

Remove spacer plates KDEP 1550 (picture a).

Put prestroke-adjusting shims under the element flanges in the same positions they were in prior to dismantling the pump (picture b).

Tighten fastening nuts to 40 ... 45 Nm.

Check control rod for freedom of movement.



Mount manifold-pressure compensator (LDA). Mount closing cover on manifold-pressure compensator.

Assemble governor in accordance with the respective repair instructions and mount on pump.

**E3**

Assemble fuel-injection pump  
PE(S).. P.. S 7100, S 7800



### 12.3 Leak test on camshaft spring chamber and governor interior

Completely assemble the pump.

The compressed air required for the leak test should be introduced into the camshaft chamber at a suitable place (e.g. oil inspection bore). Immerse pump vertically in test bath. The delivery-valve holders must not be below the level of the calibrating oil.

Test time and test pressure

7 minutes at 1.5 bar, and then

1 minute at 0.5 bar.

By means of visual examination, check whether there are leaks at any of the joints, connections, seal rings and end covers on housing and cover.

No air bubbles may be visible.

#### Note:

To prevent any skin irritation, grease your hands with protective skin cream and wash with soap and water after testing is completed.

Set the injection pump on the pump test bench.



# Technical Bulletin

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## New Product

40...46, 58

UPRATED P-pump

VDT-I-410/2 En

PE(S)..P..S7100 (7800) SERIES

1.1985

Economic considerations and legal regulations have led to the constant further development and improvement of diesel engines. Low fuel consumption and reduced exhaust emissions can be achieved through increased accuracy of injection at high peak pressures. This has led to the development of a new, uprated P-pump series. Important design features of the PE(S)..P..S 7000 series were able to be incorporated. The new series has the designation PE(S)..P..S 7100 for flat-base-mounted and flange-mounted pumps and PE..P..S 7800 for cradle-mounted pumps. The following components have been improved or are new:

### 1. Pump housing

The required higher stability when operating at higher peak pressures has been achieved by replacing the continuous, one-part base closing cover by individual end covers. The screw plugs of the mounting holes for the tappet holders have been replaced (as in the MW pump) by capsules.

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## 2. Camshaft

The drive cone has a diameter of 30 or 35 mm, depending on load. The movable bearing at the drive end is a cylindrical-roller bearing while a self-aligning roller bearing is used as a fixed bearing at the governor end. The intermediate bearing is made of steel and is provided on its bearing surface with a tin-bronze layer.

## 3. Roller tappets

The tappet roller is now one-part, i.e. the bushing between roller and roller stud has been eliminated. The previous lobe of the roller-tappet shell for holding the plunger base has also been eliminated. To increase the resistance to wear, a tappet plate has been installed between roller-tappet shell and plunger base.

### Operating principle:

Due to the new design of the bearings of the camshaft, the projection and longitudinal play of the camshaft result through the specified use of the appropriate parts. For this reason, it is not necessary to measure and set the projection and longitudinal play of the camshaft. The considerably stronger camshaft has a double cam of 6.5 mm lift for driving a sliding-tappet supply pump.

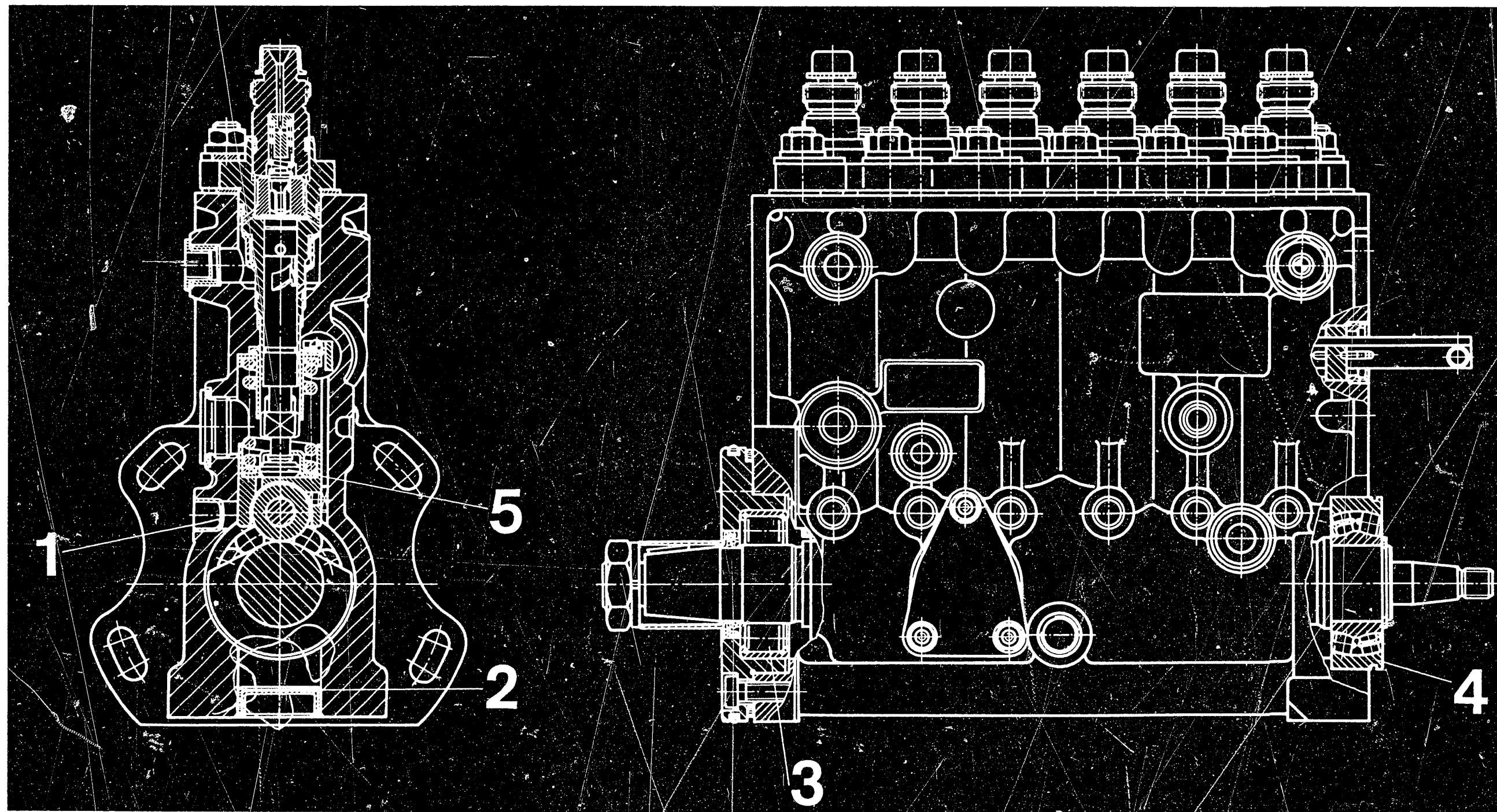
The tappet roller has a spherical bearing surface on its outer diameter.

The flange element is one-part; it is the same as the element in ..S 7000.

The repair of the pump is described in a new repair manual.







- 1 = End cover for tappet holder bore
- 2 = Base end cover
- 3 = Drive-end roller bearing
- 4 = Governor-end self-aligning roller bearing
- 5 = Tappet plate

Published by:  
 Robert Bosch GmbH  
 Division KH  
 After-Sales Service Department for  
 Training and Technology (KH/VSK)

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© 1986 Robert Bosch GmbH  
Automotive Equipment - After-Sales Service  
Department for Technical Publications KH/VDT  
Postfach 50, D - 7000 Stuttgart 1.

Published by:  
After-Sales Service Department for Training and Techno-  
logy (KH/VSK). Press date: 1.1986

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contents to our authorized representative in your  
country.

This publication is intended only for the Bosch After-  
Sales Service Organization, and may not be passed on to  
third parties without our consent.

Microfilmed in the Federal Republic of Germany.  
Microphotographié en République Fédérale d'Allemagne.

